

The Chemical Age

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Notes and Comments

Management in Industry

NEVER has the need for detailed planning and organisation in every sphere of our national life been so acute as it is to-day. The greatest importance therefore attaches to the sixth International Congress for Scientific Management which is to be held in London in July next year. The object of the conference as a whole is to publish papers and to arrange discussions on practical applications of management in all its phases. It is hoped to awaken a real consciousness as to the importance of the adoption of the best principles of management. To this end a strong council has been formed in England under the chairmanship of Sir George Beharrell. Members of the council, which was in the first place called together on the initiative of the Federation of British Industries, include representatives of professional and scientific associations connected with management in all its phases. Amongst these are the Institute of Chemistry, the Society of Chemical Industry, the Institution of Chemical Engineers and the British Association of Chemists. The Prince of Wales has consented to act as patron of the congress and the Government has promised active support. Dr. E. F. Armstrong, Sir Christopher Clayton and Sir Robert Hadfield are members of the executive committee of industrialists which has been formed to supervise the organisation of the Congress.

The congress may prove to be one of the largest held in 1935, as over 2,000 people are expected. There will be an official reception by the British Government, and by the City of London in Guildhall. Amongst the questions which will be discussed are: Methods of controlling production—(a) budgetary control, standards and forecasts; (b) scientific methods applied to works management; (c) production control to meet changes of product, of design, or of process; (d) production management technique; concrete examples of the application of scientific management to distribution in manufacturing, wholesale and retailing; methods of selection, education and training of personnel suitable for high administrative positions; what are the correct methods of inculcating modern management principles and practices in large-scale, medium and small undertakings? The subjects chosen for the congress should attract a valuable set of papers representative of the best national practice throughout the world. It is also hoped that the congress will demonstrate to the delegates that British industry is fully alive to the importance of good management, for opportunity will be offered to delegates for visits to industrial organisa-

tions which they may select. Full programmes and membership forms will be available at the end of October on application to the Secretary at 21 Tothill Street, London, S.W.1.

Fume Emission Troubles

THE report of the Inspector of Alkali Works, always a document of value, contains this year references to cases where the permissible limits for the amount of noxious fumes have been exceeded and to minor complaints of the same thing. Scotland appears to have been the major cause of trouble, including organic odours from a viscose factory (which are now being destroyed by treatment with chlorine), acid fumes from a vitriol works, acid fumes from a superphosphate works and other instances which need not be detailed here. The emission of fume or pungent odours is necessarily a difficult subject to tackle. A fume that is definitely injurious to health is one thing and an objectionable odour is another. What is an objectionable odour? The viscose factory in Roxburghshire emitted something that raised the ire of the local inhabitants. Had that same factory been situated in the Far East it is probable that the same smell which so greatly offended Scottish nostrils would have been hailed as an improvement upon the local variety.

One of the most offensive odours is that evolved—and distributed over the entire neighbourhood—by a brewery under certain stages in the process when large volumes of steam are allowed to escape into the atmosphere. There must be many, however, to whom such a smell is meat and drink. The inspector of nuisances has not yet taken cognisance of this emission, and breweries do not come under the eye of the Inspector of Alkali Works. Why should chemical works and viscose factories be under his supervision, and not the equally chemical industry of brewing? The viscose works was perhaps fortunate in being able to decide what caused the "noxious odour" and in being able to find a method of destroying it. But what causes the pleasant odour of flowers, and can this odour be destroyed by any method of treatment of the air that has passed over the flower?

Difficulty of Removing Odours

THE difficulty of removing odours is sometimes very great. The older generation will remember the "super-noxious" odour of the fried fish shop of a past generation—an odour that is still worse in the South of England than it need be—and that could not be

avoided by the methods then known. So bad was this nuisance that some towns passed a by-law that the frying of fish in shops could not be permitted within a defined area. It is usually known beforehand that any given process will or will not give off an offensive odour and the owners of those that do so should be compelled to situate their works in districts reasonably remote from human habitation. If after the factory is thus situated people build their houses in the "smell-zone" of the works, it is their own fault and the works should not be compelled to remove the smell. Tanneries are an example of a works of this class. Our objection to certain instances of the compulsory removal of a smell is that the works may be compelled to increase the operating expense of its process, an expense that may make a real difference to the financial operation of the works. If every works wherein an offensive smell was generated were compelled either to remove the smell or to remove themselves, there would be some remarkable migrations. The chemical industry seems to be more stringently controlled than others.

Turning to the deleterious fumes that may be exhausted from chemical works, we are all in favour of rigid control. Frequently, though not always, the emission of a deleterious fume means that something is being lost from the process that it would pay to recover. In such instances it is of positive benefit to the firm that there should be a statutory body able to insist that proper working conditions should be observed and the process conducted with reasonable efficiency. In other instances, where the emission of fume is just a convenient method of disposing of a waste product, the principle must be justly observed that the whole is greater than the part and the amenities of the neighbourhood shall be protected.

The Good Old Days

A LETTER written by Charles Dickens described a journey through Staffordshire to Shrewsbury in which, owing to unforeseen circumstances, he was compelled to take a route evidently not one that he would willingly have chosen: "... starting at eight o'clock through a cold wet fog, and travelling when the day had cleared up through miles of cinder paths and blazing furnaces and roaring steam engines, and such a mass of dirt, gloom and misery as I never before witnessed." Even more pungent is the comment of an early writer (1861) upon the effect of coke ovens on the countryside. He speaks of a gentleman who had spent a good deal of money on his houses and estates seeing "his flowers and fruit trees withering under the noxious influence of the smoke drifting from a collection of coke ovens recently built in the neighbourhood. It is still more exasperating to find his house filled with the same abominable fume, and to feel under the necessity at night of closing hermetically every crevice in his doors and windows whenever the breeze comes from that quarter, as without such precautions the irritation from the sulphurous particles in the air would produce in the house a continuous coughing." The article goes on to recount how the farmer is still worse affected "for he is doomed to see the sources of his livelihood gradually closed. Under the baleful influence of coke ovens, the meadows have lost their verdure, and trees their foliage; the exasperated gentry have sold their mansions to be converted into cottages, and the

baffled farmers have been compelled to emigrate; and in the end the scene has been reduced to lurid fires, blasted meadows, stricken cornfields, and the squalid habitations of swarthy workmen." The editor of the paper in question did not, however, appear greatly concerned as to the effect of the fearful conditions he described upon the workmen. So long as "the gentry" were not offended by a noxious fume he was not interested; he was even enthusiastic, for he says: "Reflection upon results will teach us to find pleasure in the contemplation even of the scenery around coal pits and coke ovens for, though not delightful in itself, it will suggest the cheerful recollections connected with an industrious and thriving population. What cannot be avoided should be patiently endured." Well might there be a saying in Yorkshire: "Where there's muck there's money."

Judgment and Care

THE above quotations reveal how different is our outlook towards noxious fumes to-day. We exercise the greatest care in guarding health by by-laws, national laws, and paid qualified inspectors. In those days the local inhabitants had no redress "provided that the industrial operations were conducted with judgment and care." The state of affairs described was not considered incompatible with "judgment and care."

The rigorous interpretation now given to the phrase "judgment and care" cannot be better illustrated than by reference to the thought now being given to the emission of sulphur and grit from chimneys. We have previously referred to the Battersea Power Station, where elimination of these very mild "noxious fumes" was made a prior condition of permission to operate. When one remembers that at the time the article we have quoted was written there were actually coke ovens operating in Westminster, the change in public outlook becomes even more marked.

Professor Keyes has recently read before the American section of the Society of Chemical Industry a paper describing his experiments to remove and recover the sulphur existing as SO_2 in the flue gases from chimneys. The first method of attack consisted in absorbing the SO_2 in a suitable liquid containing a small quantity of catalyst in solution or suspension to oxidise the sulphite to sulphate, *i.e.*, to sulphuric acid. Preliminary experiments gave a sulphuric acid of 40 per cent. concentration, but unfortunately in practice negative catalysts accumulated in the solution and insufficient concentrations of sulphuric acid were obtained. Further work on these lines appears to be not unpromising, however, but the latest method is to recover the SO_2 "dried, compressed, and sold as a liquid product at a price that will make it attractive." Is the time approaching when every factory chimney will come under the Inspector of Alkali Works? What of the motor car? Analysis of the exhaust from petrol-driven engines has shown that quantities of unburnt gases always escape in the form of carbon monoxide, the concentrations of which in the air of large towns may be sufficient to cause cumulative damage to the health of those compelled to breathe it day after day. The control that is being exercised upon chemical works is all to the good but we have a long way to go yet before the emission of noxious fumes is wholly exorcised.

The Nation's Food Supply

THE annual report of the Food Investigation Board for the year 1933 (H.M. Stationery Office, 4s. net), reviews the aims of the research work, now costing about £45,000 a year, carried out by the Department of Scientific and Industrial Research on the transport and storage of foodstuffs. These aims, the report states, have not always been fully understood. The object of the work is and always has been the improvement of the food supply for the people of this country. While the source of a particular foodstuff is not of primary consideration to the Board, the policy which it has followed in carrying out its work, in conformity with the general policy of the Government, has been to accord precedence first to home-grown produce, then to the produce of the Empire overseas, and finally to foreign produce.

In biological engineering the main work of a more practical character during the last three years has been that carried out in the experimental hold at the Ditton Laboratory. With this unique piece of equipment, it has been possible to compare the efficiency, for the carriage of cargoes of foodstuffs, of the different systems of refrigeration in current use, to determine the relative value of different methods of dunnaging cargoes, to evaluate such practically important biological constants as the thermal capacity of a stack of apples, the rates at which it generates heat and carbon dioxide, and the rate of evaporation from it, and to study on a semi-commercial scale the transfer of heat from fruit to air and from air to pipes, whether these be in the form of grids on the roof and walls of the hold, or in the form of an external cooler. All this work is of direct value to British shipping.

Researches on Meat

Muscle consists largely of two proteins, myosin and myogen. An examination of the behaviour of these two proteins when isolated from muscle has given some indication of the part they each play in *post mortem* changes. In living muscle myogen is in solution and myosin is almost completely undissolved. Up to the time of completion of *rigor mortis*, no appreciable denaturation of myosin or myogen can be detected, but in the dead flesh denaturation is rapid. This work has also shown that the "stiffening of *rigor*" cannot be attributed to the denaturation and flocculation of protein; instead, it now seems probable that the phenomenon is due to a change in the water-relations of myosin consequent upon the changes in the distribution of ions in the muscle.

Progress has been made in elucidating the water-relations of native and denatured proteins, in both the sol and gel states. Whilst the exact amount of water associated with unit mass of a protein is probably a fundamental property of that protein, it has been found that the amounts for the different proteins investigated vary within comparatively narrow limits. The water held can be regarded as being made up of two portions, one very firmly held, the adsorption of which is accompanied by a considerable decrease in the free energy of the system, the other much more loosely held and removable, for example, by moderate freezing or pressure. The properties of this second type of water and how it differs from ordinary free water in bulk are, however, still obscure. By a thermodynamic treatment it has been possible to compute the amounts of water frozen out from muscle at different temperatures, and the figures so calculated agree with those determined by direct experiment.

Oxidised Fats

The unpleasant odour and flavour of oxidised fats is due to the presence of minute amounts of aliphatic aldehydes. A method has been worked out by which the presence of the aldehyde in fats can be estimated in quantities down to 0.001 per cent. This research is a contribution to the most fundamental problem in food-preservation, that of assessing flavour by laboratory methods.

In the report for last year it was shown that the bacterial load picked up by a carcase during dressing and handling determines its life in store. This work is being extended by determining the rates of growth at different temperature and humidities of the different bacteria commonly found on meat.

Will the Research Work of the Food Investigation Board Ultimately Repay the Money which is being Spent?

An investigation is also in progress to define the value of ozone as a germicide in the preservation of meat, and the extent to which this is vitiated by its power to oxidise fats. Further work on the effects of different concentrations of carbon dioxide on the colour of beef-fat has again emphasised the absolute necessity for using low concentrations of carbon dioxide (less than 20 per cent.) if the bloom of the meat is to be preserved.

Fruit and Vegetables

It was reported last year that ripe apples give off some substance which, even when present in the air in very small quantities, stimulates the irreversible change, termed the climacteric, which ushers in the senescent phase of life, and which is accompanied by a marked increase in respiratory activity. It has now been shown that bananas, peaches and pears also produce this or a similar substance, but not oranges and grapes. The fact that post-climacteric apples evolve a substance which induces the climacteric in other apples which have not yet reached the stage at which it is auto-induced, has the interesting result that when apples are kept confined together in a group, the climacteric occurs nearly simultaneously in all the individuals at about the time when it is auto-induced in the most advanced fruit of the group; while if similar apples are isolated in separate containers, the self-induced climacterics are spread over a considerable interval.

The postponement of the climacteric, and of the concomitant increase in respiratory activity, is accompanied by a corresponding lengthening of the life of the fruit. It has now been shown that the effect of carbon dioxide in the atmosphere, as in gas-storage, is not only to depress post-climacteric respiratory activity, but also to delay markedly the occurrence of the climacteric itself.

In the analysis of the factors affecting the climacteric, it has been found that supernormal concentrations of oxygen in the atmosphere accelerate the occurrence of the climacteric, while subnormal concentrations delay it. Ozone in concentrations of about 50 parts per million appears to induce its immediate occurrence.

The total volatile products of the metabolism of fruit, other than carbon dioxide, are now being measured, and it has been found that their production increases at the climacteric, and that a large part of them can be retained by phosphorus pentoxide or concentrated sulphuric acid.

End Products of Apple Flesh

Another important fact established during the year is that, with the progress of senescence of apples in air, there is a steady rise in the amount of alcohol and acetaldehyde present in the flesh. It will be recalled that the tentative conclusion has been drawn from work already reported that acetaldehyde is a critical intermediate product in the breakdown of sugar, and that the fate of the sugar, either as alcohol and carbon dioxide (fermentative end-products) or as carbon dioxide and water (oxidative end-products) depends upon the concentration of acetaldehyde in the tissues. It is now further suggested that senescence in air is characterised by a progressive failure in the mechanism for the oxidative removal of acetaldehyde, and, moreover, that this failure is due to a toxic action of oxygen. This suggestion is further supported by evidence that if the atmospheric concentration of oxygen is kept low, the accumulation of both aldehyde and alcohol in the tissues is markedly slowed, and the life of the fruit correspondingly extended.

Further investigations are being pursued on this subject. For example, the effects of artificially raising the amount of ethyl alcohol in apples by feeding them with the vapour on lines similar to those of the experiments with acetaldehyde, already reported, are being investigated. It has been found

that the amounts of alcohol that sound fruits will tolerate without injury are much higher than those found in tissues killed by continuous exposure to an atmosphere free from oxygen. This involves a revision of the view generally held up to the present, that death in the absence of oxygen is due to alcoholic poisoning.

Work on the freezing of fruits and vegetables has continued, and the advantages of quick freezing with a certain type of strawberry well illustrated. So far, no advantage has been found in freezing fruits out of contact with air, but the question is still under consideration. Particular attention has been paid to the time required to blanch peas before freezing, and to the effect of hardness of water for this purpose. Other subjects investigated during this year have been the metabolism of carbohydrate and the respiration of half-grown apples during storage; the metabolism of carbohydrate in apples stored in the frozen condition in the presence and absence of oxygen; the reaction of fruits to wounding; the effect of freezing on the yield of seed-potatoes; and the possibilities of ethylene for retarding sprouting in clamped potatoes.

At the Imperial College of Science and Technology both chemical and mycological work have been continued. On the chemical side, the composition of different parts of the apple-fruit has been further studied. Sugar is found in higher concentration in the region of the calyx than in that of the stalk, and also on the "blushed" side as compared with the "unblushed." These and earlier results suggest that there is a gradient of increasing concentration of sugar running radially outwards from the stalk towards the skin, the gradient being steeper towards the "blushed" part of the skin. Further experiments are in progress on the relationship between loss of sugar and output of carbon dioxide in apples.

Pork, Bacon and Hams

In view of the re-organisation of the pig industry, a special investigation of tank-curing has been carried out. A study of the composition of tank-pickle has been undertaken, and it has been found that although this fluid is used over and over again, its composition is kept surprisingly constant. In collaboration with the British Food Manufacturers' Research Association, values have been obtained for the rate of penetration of salt into the lean during both tank-curing and dry-salting. These results show the great importance of injecting pickle into the sides at the beginning of the cure.

Experiments on gas-storage have been continued with pork and bacon. Mild-cured bacon has been stored in an atmosphere of carbon dioxide at a temperature of 0° C. (32° F.) for 18 weeks. The bacon was then in excellent condition, and members of the industry were greatly interested in it. In another experiment bacon was kept in excellent condition for as long as eight months at temperatures of -3° C. (26.6° F.) and at -10° C. (14° F.). These experiments show that the problems presented in the prolonged storage of bacon can be successfully solved in the laboratory by the use of a complete atmosphere of carbon dioxide. To test the commercial possibilities, a small gas-tight store, capable of holding 30-40 sides of bacon, has been designed.

Canning Investigations

The investigation of corrosion in regard to canning has continued, and results of interest have been obtained by varying the amount of oxygen in the system, and the size and position of lacquered areas on totally immersed steel strips. The variation of the steel base of tin-plate has been further studied, but cannot yet be related to the method of manufacture. Incidentally, it has been found that hydrogen can penetrate through steel and tin-plate, and form blisters on the opposite side of the sheet to that actually in contact with the corroding medium. Metals, such as stainless steel, copper, and various alloys containing copper, which are used in the manufacture of equipment for the food industry, have been further investigated, and the breakdown of a sample of stainless steel under air-free conditions, and the methods by which it was again rendered passive, are of interest.

The rate of destruction of pectin by enzymes, as indicated by the strength of the pectin-sugar-acid gel prepared from fruits stored at temperatures of -10° C. and -20° C., is being determined. No measurable destruction has been found at the lower temperature, but at the higher it was between 15 and 25

per cent. with raspberries and 35 per cent. with gooseberries. The effect of various methods of canning on the vitamin in apples has been considered, in collaboration with the Medical Research Council. It has been confirmed that soaking in weak brine before canning protects vitamin C, and that leaving the peel on unsoaked slices has a similar effect.

Fish and Fish Oils

At the Torry Research Station the study of the effects of cold storage on the flesh of fish has continued. The production of "drip" in relation to temperature and length of storage, differences in response to cold storage of different species of fish, and the behaviour of thawed-out, brine-frozen fish in comparison with fresh fish when packed in ice, are topics that are under consideration. Hitherto the resources of the Station have been almost wholly engaged in dealing with white fish, but a start has now been made with work on the herring. The first of these investigations aims at improving the smoking of this fish by defining the conditions required for the production of kippered herrings of high quality. If herrings are rapidly frozen in cold brine and stored at a low temperature, they will retain their quality for a considerable period. Kippers made from such herrings after four months' storage are barely distinguishable from those made from the freshest fish.

In continuation of the work on the metabolism of fat in fish, the conger-eel and two marine mammals, the dolphin and the porpoise, have been studied. The data thus obtained support the theory that the high selectivity of the animal in laying down its depot fats, rests on the basis of filtration by molecular size. The medicinal value of the oil extracted from the liver of the halibut is becoming more widely known, and already these livers, which until quite recently were regarded as useless and were thrown away, are finding a ready market. The large fluctuations in the amounts of vitamin A found in the halibut's liver appear to be seasonal, and to be related to the seasonal fluctuations in the numbers of diatoms in the sea.

Theory Lags Behind Practice

The present report emphasises the importance of basic investigations for increasing the present meagre knowledge of the fundamental properties of foodstuffs. It states that "it is to such work that we must look for large advances in the technique of storing and transporting food—for instance, the principle of gas-storage, the possibilities of which are only beginning to open out, was established at the Low Temperature Research Station as the result of a purely scientific inquiry into the phenomenon of dormancy in seeds and, in a field where theory lags so far behind practice, it is just such work that is most needed." It is, indeed, impossible to predict in what directions the results of such work will find application, for it sometimes happens that research in one field finds application in quite another field. For instance, the study of chemical changes in the fat of beef and mutton have been applied in the storage of butter, bacon and vegetable oils.

Wear-Resisting Bronze

The Maintenance of Reciprocating Parts

THE application, by the oxy-acetylene process, of wear-resisting bronze to the wearing surfaces of sliding parts is dealt with in a booklet which has been published by The Linde Air Products Co., of 30 East 42nd Street, New York. This booklet, "The Maintenance of Reciprocating Parts," makes a valuable addition to the existing literature on the subject of bronze-welding by reason of the comprehensive manner in which it treats one of the most important applications of the oxy-acetylene process. After a brief general discussion, the advantages of bronze-surfacing as an economical and efficient means of reclaiming pistons and similar wearing parts are set forth. The wide scope of the application is detailed by mentioning examples of successful use of the process in a number of fields. Other sections discuss frequency of application, and the importance of wear-resisting bronze welding rod, while the final section is devoted to a complete description of the correct procedure to be followed in the re-surfacing operation.

The Chemical Industries of France

FRANCE, which by 1928 had raised in a fundamental manner her international position as a producer of chemicals by her immense technical and financial exertions both during and after the war, has not ceased to consolidate and expand the bases of her new chemical powers. After the conclusion of peace, the modern framework of the French chemical industry was laid by the reconstruction and enlargement of the chief works in the war zone; by the improvement of various units elsewhere that for war necessities had already been stimulated into maximum output; by new construction and equipment on a large scale in numerous branches, such as the development of the recovered Alsatian potash mines, the production of bauxite, aluminium, and other electro-chemical and electro-metallur-

Developments of the Past Five Years Indicate Important Progress

then, of two modern refineries (near Douai and at Pechelbronn in Alsace), France had added, before 1934, four new refineries along the Seine between Rouen and Havre, capable of treating a total of $2\frac{1}{2}$ million tons of crude oil a year, two near Marseilles, two near Bordeaux, one at Dunkirk; and had three or four more under construction. In 1928, French oil refineries supplied perhaps 6 or 7 per cent. of home consumption, in 1935 they are expected to supply well over four-fifths.



The works of Bozel-Malétra (Société Industrielle de Produits Chimiques) at Villard de Planay, near Bozel, Savoy.

gical products, nitrates, synthetic ammonia, sulphate of ammonia, phosphates and various fertilisers, dyestuffs and other coal tar and coke-oven by-products, rayon, photographic, and pharmaceutical products. Other notable achievements for the due completion of this structure included higher technical organisation, greater sectionalisation of output, new provision for the research of processes by creation of large laboratories at the chief works, more adequate financial organisation, and a higher degree of centralised or collective direction.

According to a report on "Economic Conditions in France," dated June, 1934 (H.M. Stationery Office, price 7s. net), the years 1928-33 have shown noteworthy national advance in many directions. Perhaps the most signal has been the realisation on a large scale by 1933 of the national mineral oils refining policy legislatively adopted in 1928. Possessor,

The co-operation of great chemical concerns with the coal industry has also resulted in marked progress in the output or equipment for output of various coal, coke-oven and gas by-products; and in certain important branches, such as nitrogen, sulphate of ammonia, nitric acids, sulphuric acids, cyanamide, fertilisers, industrial alcohols, dyestuffs, synthetic perfumes, rosins, paints, varnishes, photographic, pharmaceutical, and other heavy and light chemicals much advance has been made. Thus the production of the State works at Toulouse, which cost over 500 million francs, rose from 2,500 tons in 1928 to 24,000 in 1931, when 16 or 17 other works produced 45,000 tons of synthetic ammonia in the Claude and Casale processes, and the production of cyanamide reached 64,000 tons.

Superphosphates from the blending of phosphates with sulphuric acid increased from 1.5 millions in 1929 to 2.4 millions

in 1931, and crude potash salts from 2.6 millions in 1928 to 3.13 in 1929 and 1930. Benzol output rose from 2,300 tons in 1923 to an average of 76,000 for 1928-30. In the electro-chemical group the production of carbide of calcium, which averaged 72,000 tons for 1924-27, reached 88,000 and 105,000 tons in 1929 and 1930.

Foreign trade also indicated great progress up to 1930, despite the increase in capacity of, and of competition from, the United Kingdom, the United States, Germany, Japan, and other countries. Exports of manufactured chemicals for the three years 1928-30 averaged 3,051,500 tons compared with 2,841,500 tons for 1925-27, with 1,274,400 tons in 1913, and with 1,666,300 tons in 1932; while in 1933 a continued advance was shown, 1,907,264 tons being exported. Imports averaged 974,600 tons for 1928-30, compared with 555,000 tons for 1925-27: the increase was mainly due to the phenomenal increase of imports of products directly derived from coal-tar distillation, which averaged only 25,400 tons for 1925-27, but 404,800 tons for 1928-30, and were 714,000 and 600,000 tons in 1932 and 1933. Imports in 1933 amounted to 1,230,827 tons, or 88,397 tons less than in 1932.

Synthetic Nitrates and Fertilisers

In 1913, France consumed 63,500 tons of nitrogen (azote), of which she produced 15,000 tons in the form of 74,500 tons of sulphate of ammonia: in recent years (1927-30), she consumed 140 to 150,000 tons of nitrogen, of which 45 per cent. was produced at home. The great State works at Toulouse, erected in recent years at a cost of 500 million francs, had alone raised its output from 2,500 tons in 1928 to 24,000 tons in 1931: its present capacity is about 40,000 tons, corresponding to 80,000 tons of ammonium sulphate (16,000 tons of nitrogen), 80,000 tons of ammonitrite (12,000 tons of nitrogen), and 80,000 tons of nitrate of soda (12,000 tons of nitrogen). Synthetic ammonia is now produced at 16 or 17 private works, which are stated to have attained an output of 45,000 tons by the Casale and Claude processes. French production of sulphate of ammonia has risen from 74,500 tons in 1913 to 420,000 tons in 1929.

The production of other nitrogenous fertilisers has also expanded. Cyanamide production in several electro-chemical works in the Alps and in the Pyrenees reached 64,000 tons (or five-sixths of French consumption) in 1931, compared with 12,000 tons in 1913. Nitrate of lime and nitric acid have also increased: the latter now reaches about 30,000 tons a year, produced by oxidation of ammonia under the action of catalysers and though inferior to the consumption, the output is stated by the central chemical organisation to be rapidly increasing. Synthetic acetic acid (*e.g.*, for acetate rayon), and synthetic ether have been realised. Developments have also occurred in the manufacture of composite fertilisers, uniting at least two of the three principles of phosphate, potash, and nitrogen: there have been placed on the market, potazote (nitrate of ammonia and sylvinitite), phosphozote (cyanamide of lime and urea) and nitrate of potash.

Coal and Gas By-Products

The numerous forms of derivation of by-products from coal, coke, and gas manufactures having been little practised until after the war, France failed, until recently, to derive due chemical yields therefrom: thus, coke and gas production and coal distillation did not provide benzol and other valuable by-products. As a consequence of the new practice, the output of benzol rose from 23,000 tons in 1923 to 68,000, 80,000 and 81,400 tons in 1928-30. Formerly the gasworks and cokeries sold tar without seeking first to extract its by-products.

Since 1923 there has existed the legal obligation upon producers of lighting gas to extract the benzol content in course of the refining process; and no tar must be used for roads before distillation, so that it yields phenol, cresol, benzene, toluene, pyridine, naphthalene, anthracene, and other products. The chemical results of this measure may be gauged from the fact that the quantities of tar used for roads in France increased from 30,000 tons in 1922 to 450,000 tons in 1931. The total output of tar in France in 1929 and 1930 was 561,000 and 595,000 tons.

The alliance, in recent years, of the chemical works with the collieries has been fertile in results, some particulars of

which are given in the coal chapter of this report. It suffices to mention here that numerous chemical products and by-products of the cokeries, gasworks, and distillation plants are now duly recovered. Hydrogen is now extracted from the coke oven gases, which were formerly employed merely as fuel; and they yield also carbonic oxide, methane, ethylene, whence, by later operations, are derived methyl alcohol (for mixture with benzol), ethyl alcohol, ether and other products.

Dyestuffs Industry

The most familiar example of French progress in output is the case of dyestuffs. In 1913, when French consumption was 9,000 tons, that output was 7,000 tons, but its manufacture was practically a German monopoly, for, of the ten works in France, six were German owned, and three were obliged to obtain intermediates from Germany or Switzerland. Only one French firm (at St. Denis, near Paris) was a producer of certain intermediates. The situation is now completely transformed: the output, which is entirely in French hands, has in recent years ranged from 15,000 to 16,600 tons, which has allowed exports of 3,000 to 5,000 tons (in 1927); and imports, which in 1920 still represented 53 per cent. of French consumption, amount to 10 or 12 per cent. (85 per cent. from Germany, 10 per cent. from Switzerland).

France now claims to rank fourth in the world as a producer of dyestuffs, coming after Germany, the United States and the United Kingdom, and being more or less on a level with Switzerland. The advance is not merely in quantity. Few intermediates have to be obtained from foreign countries. Since 1924 a number of important new dyes have been discovered by the French industry, such as acid dyes resisting light and fulling operations, chrome dyes, direct dyes for cotton, vat dyes known as solanthrine, cotton dyes (naphthazols), special dyes for acetate rayon, vat non-indigo dyes for wool, special products for dyeing furs (which, formerly a German speciality, has been a leading cause of the maintenance of the great Leipzig annual fur fair), and numerous special leather dyes.

Some Comparative Figures

The following table gives details of the production for the years 1926-31:—

	1926 tons.	1927 tons.	1928 tons.	1931 tons.
Dyes—Mizarine	634	455	588	610
Azoic	6,620	5,320	6,622	6,610
Sulphur	2,080	1,443	1,871	2,410
Di- and Tri-phenylmethane Indophenolazines, Oxazines and Thiazines	973	701	712	1,085
Indigo	234	184	246	115
Miscellaneous	4,307	5,713	2,956	4,250
	1,759	1,700	2,109	870
	16,607	15,516	15,104	15,950

For 1929 and 1930 French output is given at 16,830 and 15,950 tons: of the former figure 3,450 were classed as acid, 4,640 as vat, 3,600 as direct, 1,800 as sulphur, and 770 as basic dyes. The large-scale provision made for research by the French Dyestuffs Corporation, which controls directly nine-tenths of the production, and by the remaining firm, is likely to keep the industry well abreast of new developments.

Synthetic Resins

The output of synthetic resins, an essential constituent of synthetic camphor, which was started in 1918, is now about 1,500 tons a year. Resin from the essence of turpentine and of colophane, has been always abundantly produced from the pines of the Landes (from Bordeaux almost to Bayonne): in 1930, output was 30,000 tons of turpentine and 110,000 tons of colophane. The output of plastic materials with bases of synthetic resin, or of cellulose, or of milk, has been important. The exports of celluloid in 1929-31 averaged 1,106 tons, against imports of 346 tons. Viscose (and its derivative cellophane) has been developed on a large scale for the rayon industry. Half-a-dozen manufacturers of casein (used as a substitute for ivory, horn, ebonite, tortoise-shell, vulcanite, etc.) now produce 40,000 to 45,000 tons a year, compared with 1,200 tons in 1924.

In photographic material, considerable progress is claimed for developing products, notably metol and hydroquinone. In 1928-33, exports of metol advanced from 18.2 to 49.7 tons, while imports declined from 1.1 to 0.3 tons; and exports of hydroquinone averaged 42.5 tons, against 2.2 for imports.

In the category of paints and varnishes great advance is claimed. Home production of industrial paints, which in 1913 is said to have reached only 7 per cent. of the demand, is now 85 per cent. Crushed barytes output rose from 12,000 tons in 1918 to 40,000 tons in 1927; lithopone from 1,500 to 30,000 tons in 1929, its imports having decreased from 11,000 tons in 1925 to an average of 178 tons in 1929-33. Cellulose varnishes, which have been those in chief demand in recent years, are largely produced in France.

Semi-Finished and Fine Chemicals

Great advance appears to have been made in other branches of semi-finished and fine chemicals, notably in those dependent upon coal tar derivatives, as a consequence of the immense development in coal tar distillation in France. Among these are synthetic pharmaceutical products, perfumes, camphor, and resins. France, who had previously been almost entirely dependent on German synthetic pharmaceutical preparations, now exports far more than she imports in numerous cases. Thus for the three years 1928-30 the imports and exports respectively of the following synthetic organic pharmaceutical products averaged:—

	Metric cwt. (220 lb.).	
	Imports 1928-30	Exports 1928-30
Chloroform	51	332
Ethyl Chloride	7	236
Medicinal Resorcin	3	497
Guaiacol	50	145
Guaiacol Salts and By-Products	94	210
Salicylic Acid	42	250
Other Salicylates	80	331
Salicylate of Methyl	30	418
Acetylsalicylic Acid	104	1,302
Phenacetin	50	672
Analgesin and Salts	34	210

The exports of synthetic pharmaceutical products, which

amounted to 1,210 tons in 1913, averaged 1,777 tons for the eight years 1923-1930 (1,460 and 1,060 in 1931 and 1932): imports, 113 tons in 1913, averaged for the same period, 430 tons (but 1,940 and 2,240 tons in 1931 and 1932). Before the war, France already possessed an important pharmaceutical output in ordinary and in organic products like quinine, cocaine, morphia, heroin, etc. Her output capacity for quinine is estimated at 50 to 56 tons, but under international convention her quota is restricted to 45 tons; her exports of quinine and quinine salts averaged 41.5 tons in 1928-30 (imports 0.2 ton). Here manufacture of cocaine is estimated to have averaged 1.1 tons for 1926-28, and that of morphine and heroin to have been in 1928, 7.3 and 3.4 tons respectively.

The manufacture of the chief synthetic perfumes (vanillin, terpineol, heliotropine, artificial musks, benzoic and cinnamic aldehydes, hydroxycitronellal), which are now made by about fifteen manufacturers in Paris and Lyons, has been mainly developed since 1919. The precise output of each is not known, but an official report in December, 1932, mentions that, of terpineol, one of the most important, the annual output is 150 tons, of which one-third is exported; and that the annual value of the output of these synthetic perfumes is about 125 million francs in periods of normal trade. Synthetic camphor, which is making some progress for use in the manufacture of celluloid, smokeless powders, and certain pharmaceutical products, is inferior to the home demand, but in 1927 the exports amounted to 105 tons.

Industrial Alcohols

The production of industrial alcohols is becoming far more important as one consequence of the endeavour to secure a satisfactory native carburant. Beet-root alcohol, which is bought at a fixed price by the State, is the principal product; out of a total production in 1931-32 and in 1932-33 of 3,900,000 and 3,128,000 hectolitres, beet alcohol represented 1,716,000 and 2,435,000 hectolitres. Wine distillation, which yielded in 1931-32 over 260,000 tons, gave in 1932-33 only 100,200 hectolitres. There are about 70 beet-root distillers, the vast majority to the north and north-east of Paris, where molasses also are principally distilled, others being in the Mediterranean region.

The Electrodeposition of Shellac

By N. NARASIMHAMURTY and M. SREENIVASAYA,

A solution of shellac in alkali carbonate has the properties of a true colloid, and the shellac micelles which are formed carry a negative charge and migrate toward the anode under the influence of a difference of potential. This suggested the possibility of electrodeposition of lac, which has been investigated at the Indian Institute of Science, Bangalore, and reported in "Industrial and Engineering Chemistry," August, 1934.

WHATEVER be the nature of dilute solutions, there is little doubt that concentrated cuts of shellac exhibit marked characteristics of a true colloid. They show the properties of inhibition, syneresis and setting similar to those of a typical hydrophilic colloid such as gelatin. The shellac solution can, in fact, be employed as "office glue" with advantage. Salts coagulate the alkaline solution of shellac, throwing out a jelly-like spongy mass which, on squeezing, yields a solid. This on treatment with distilled water can be reprecipitated, yielding the original colloidal solution.

While attempting to electrodeposit alkaline solutions of shellac, it was observed that shellac was deposited on the parchment membrane nearest the anode. Shellac micelles therefore carry a negative charge similar to that carried by an aqueous suspension of shellac in the experiments of Picton and Linder. ("J. Chem. Soc.," Trans., 1897, 568). This suggested the possibility of electrodeposition of shellac from its alkaline solutions, and the present communication deals with a study of the conditions of deposition and the nature of the deposit.

Preliminary trials showed that nickel, copper, and lead anodes were unsuitable since they were attacked; with an aluminium anode, no deposition took place (possibly because of the formation of a thin insulating oxide film as in the case of the aluminium electrolytic rectifier). A platinum anode

has been used throughout as being the most suitable since this investigation involved a study of the chemical composition of the deposit. A nickel cathode was employed in all the experiments.

A 10 per cent. cut of Palas (*Butea frondosa*) seed lac in 1 per cent. sodium carbonate solution (free from wax) was placed in a platinum basin which served as the anode, and a rod of nickel dipping into the solution acted as the cathode. Electrodeposition was allowed to proceed at 6 volts, a current of 0.2 ampere (0.0052 ampere per sq. cm.) flowing in the initial stages. As the deposit grew thicker, the current decreased to a value as low as 0.03 ampere (0.0008 ampere per sq. cm.). By progressively increasing the voltage, the original strength of the current could be maintained, but such high voltages are not conducive to obtaining either a uniform deposit of resin or an increased yield of deposit, because of the vigorous gassing at the electrodes. By mechanically scraping out the deposit, however, the phenomena could be continued.

With a given deposit, the material nearest the electrode surface was white, porous, and crisp. The outer layer was brownish. Successive deposits, after scraping off the previous ones, became thinner, browner, and less crisp. As the solution became weak, the deposition was slow and the current value was reduced to 0.01 ampere. The residual solution at this

stage was treated with dilute sulphuric acid and the resulting precipitate of lac recovered, washed free from acid, and dried. The sample on analysis showed that its properties were very similar to those of the original lac. Deposition of shellac on the anode was obtained from other alkaline solutions such as ammonia, sodium silicate, etc.

Influence of Electrolytes on Deposition

For a study of the nature of the deposit, genuine kusum shellac and "pure resin" (the ether-insoluble portion) were used. In both cases a thin, transparent, insulating film was obtained which offered resistance to a further flow of the current a few minutes after the start of the experiment. By frequent removal of the film, however, further deposition could be secured, and a sufficient quantity of the substance was thus obtained to establish its identity with the original resins.

In the case of shellac and "pure resin" solutions, the resistance offered to the flow of current was very high as compared with seed lac solution, which is presumably associated with electrolytes, including laccaic acid. The ash content of seed lac, in fact, is higher than that of shellac. It was of interest therefore to determine if additions of electrolytes to shellac solutions would improve the deposition.

Electrodeposition experiments were carried out with solutions of shellac and "pure resin" in the presence of sodium chloride. It was found that the rate of deposition far exceeds that obtained with seed lac solutions, and continues for a longer time. In the presence of high concentration of sodium chloride, the size of the shellac micelle is found to increase, giving a bluish opalescence. With still higher concentrations actual precipitation of shellac takes place. Thus it is probable that the increased size of the ionic micelles is partly responsible for the increased rate of deposition in the presence of salt. The more easily noticeable effect of the addition of salt is the increase in conductivity of the shellac solution and the porosity of the deposit which, unlike the tough insulating deposit, helps in maintaining the current. Other salts such as sodium sulphate, sodium nitrate, sodium acetate, and ammonium sulphate were employed. Sodium chloride was found to be the best from the point of view of the rate of deposition. With sodium acetate, however, the deposit was dark, slimy, and gelatinous. Shellac deposition in the presence of electrolytes occurs with such great ease that a simple voltaic couple of copper and zinc is sufficient; the deposition takes place on the zinc surface.

Examination of the Deposit

The deposits obtained from solutions of seed lac, shellac, and "pure resin," after washing with distilled water, were subjected to electrodialysis to insure a more complete removal of the electrolytic impurities. The material was then dried *in vacuo* in a desiccator over sulphuric acid. Each sample thus obtained can be mechanically separated into three portions: (a) a brown mass melting between 74° and 78° C.; (b) a whitish brown substance commencing to soften at 70° C. but not melting even at 110° C.; and (c) a whitish mass which is infusible and insoluble in all organic solvents, sodium carbonate, and dilute alkali solutions.

The bulk of the anode deposit was extracted with absolute alcohol, yielding a dark green solution; films from this solution have a greenish tinge and possess a greater resistance to water. The acid value of the extract ranges from 99 to 119, which is nearer that of the ether-soluble portion than that of shellac. The alcohol-soluble portion of the anode deposit has a higher percentage of the ether-soluble portion than shellac. The alcohol-insoluble portion of the deposit, constituting about 70 per cent. of the anode deposit, appears to be identical with the infusible whitish mass described above. Both these samples can be rendered soluble in alcohol by the glacial acetic acid treatment.

One of the main effects of the chlorine ion on the deposit appears to be to polymerise or harden the "pure resin" fraction of shellac during electrodeposition. The polymerisation is favoured by the nascent chlorine liberated at the anode. It was of interest to study the nature of this change with a view of determining how far the phenomenon corresponded or differed from the polymerisation brought about by heat, on the one hand, and by hydrochloric acid on the other.

Iodine values were determined by the Wijs method, the procedure being the same as that described by Langmuir

(A.S.T.M. Standards, "Standard Methods of Testing Shellac") except for the fact that a small trace of hydrochloric acid was added to facilitate the solution of polymerised lac. Saponification values were determined by a procedure described by Whitmore and Weinberger ("Ind. Eng. Chem., Anal. Ed., 1932, 4, 48). Acid values were determined electrometrically with a quinhydrone electrode as described by Narasimhamurthy (Indian Science Congress, 1932).

A comparative analytical study of the samples, with reference to their acid, saponification, and iodine values, gave the results shown in the following table:—

Sample	Shellac	HCl—Polymerised Shellac	Pure Resin	Electropolymerised Lac A	Bleached Lac
Iodine value	15.8	16.1	9.7	7.7	8.0
Acid value	72.4	...	59.2	...	94.0
Saponification value:					
0.5 hr.	211.0	209.0	232.0	247.0	258.0
2.5 hr.	217.0	212.0	237.0	255.0	258.0

Heat-Hardened Shellac

When shellac is heated at 150° C., the molten mass gradually turns viscous and in about 70 minutes is converted into a rubber-like mass which soon hardens into a brittle, dark brown resin. This change is accompanied by the release of water and vapours of an acid character which render the mass porous. This heat-hardened shellac is soluble in alcohol only to the extent of 25 per cent., and the acid value of the extracted fraction (113) corresponds to that (114) of the ether-soluble portion of shellac. The insoluble residue is only partially soluble in acetic acid, unlike that of electropolymerised or hydrochloric acid-polymerised shellac.

The polymerisations brought about through the agency of heat differ from those brought about by hydrochloric acid. During heat polymerisation water is split off; this is probably due to the formation of lactides, the hydroxyl and carboxyl groups of the aleuritic and shellolic acids participating in the reaction. The hydrochloric acid polymerisation is mainly a process of aggregation of molecules into a more complex one, effecting a more or less complete saturation of the residual valences.

Harries and Nagel ("Kolloid Z." 1923, 33, 247) have observed that hydrochloric acid-polymerised shellac or "pure resin" is more difficult to saponify than the corresponding untreated substances. Nagel and Körnchen ("Wiss. Veröffentlich. Siemens-Konzern," 1927, 6, 235) extended their observation to shellac which had become insoluble on ageing, and found that it exhibits a decreased rate of hydrolysis. Heat polymerisation of shellac or "pure resin," however, does not alter its rate of saponification.

The Rate of Hydrolysis

The above conclusions regarding hydrolysability have been drawn from the yields of potassium aleuritate obtained by the hydrolysis of the samples with 5*N* caustic potash. The rate of hydrolysis of the polymerised samples is not very different from that of the untreated control samples. The saponification value of the hydrochloric acid polymer is practically the same as that of the control. In the case of the electropolymer there is a distinct increase in the saponification value as compared with the value for the untreated "pure resin." This points to the conclusion that electropolymerisation is accompanied by an oxidation of the resin, resulting in an increase of carboxyl groups, the oxidation being brought about by the nascent oxygen or chlorine evolved during the deposition. Such a type of oxidation occurs during the bleaching of lac whose saponification value should therefore be expected to be high.

The insoluble portion of the electrodeposited lac consists entirely of the modified "pure resin" and has been found to be rendered soluble by glacial acetic acid treatment. The resulting product, while being soluble in ethyl alcohol, is completely insoluble in ether. It is curious that both the electropolymer and the well-washed hydrochloric acid polymer of lac require for their solution in acetic acid a trace of hydrochloric acid. Electrodeposition of shellac has possibilities of wide application. Experiments are in progress for obtaining insulating coatings on metal surfaces by simultaneous electrodeposition of rubber and shellac from a mixture of their alkaline solutions. The possibility of recovering shellac from waste products will also be investigated.

Water Supplies for Chemical Works are an Important Item

By J. H. West, M.I.Chem.E.



The recent drought has emphasised the utility of private water supplies. This photograph shows well drilling operations, by C. Isler & Co., in progress at the offices of The Chemical Age.

SUITABLE water supplies are of great importance to almost all chemical works, and, in the case of certain branches of the industry where large quantities of water are required, this question may be a predominant one in the selection of the best site for a new works.

Water is usually required for boiler feed, cooling and condensing, process work, and fire hydrants. The qualities of the water necessary for these various purposes are not identical, and consequently several sources of supply are often sought for so as to get the best results with the least expense. The usual sources of supply include town mains, wells, rivers and canals, small streams, sea and estuary waters.

The desirable features of a boiler feed water are absence of suspended matter and dirt, a very low content of scale-forming salts and dissolved oxygen and CO_2 , and a fairly low content of non-scale-forming salts. The water must, of course, be entirely free from acid and definitely alkaline, yet it should be free from sodium carbonate or the gun-metal fittings will be attacked. The question of boiler feed is far more important in a chemical factory than in other factories with steam power plants, because a considerable proportion of the steam is usually consumed as "live" steam and the condensate from it does not return to the boiler house, consequently the "make-up" for the feed may reach quite a high percentage of the whole feed. Clean water is very essential for boiler feed, and this practically limits the sources of its supply to town mains, wells, or water from a clean stream. The first two may require softening, and the last in moorland districts must be watched for acidity. River and canal water is rarely suitable for boiler feed without softening and very often filtration as well, whilst sea and estuary water must be ruled out altogether.

Cooling and Condensing Purposes

For cooling and condensing, washing down and similar purposes the quality of the water is much less important and cheapness is the main consideration. Other questions must not be overlooked entirely. With a hard water scale will surely be deposited at the hot end of condensers and coolers if the temperature exceeds 80°C . or even 60°C . with some with some waters. Much suspended matter may result in pumps getting choked or unduly worn if the suspended matter is gritty, and cooling surfaces will get coated with a film of solid matter and lose their heat transmitting efficiency. Corrosion, too, may give trouble if the water is acid or salt. An important point in cases where low-boiling liquids have to be condensed or cooled is the summer temperature of the water. River or canal water and sea water warm up considerably in the summer and may reach 65° to 70°F ., and this will make a tremendous difference to the quantity required in these cases as compared with water at a winter temperature of 40°F . or even lower. Well water, especially from deep wells, varies least in temperature between winter and summer, and the variation of town water will depend upon its original source, well or otherwise, and the time it is kept in storage.

Cooling water is very generally wasted in chemical factories. Control valves are opened wide in the summer and then left so. Even river water costs something for pumping, and it is a good plan for the factory manager to send someone round to all the cooler outlets with a thermometer at intervals and have all the control valves closed until the outlet temperatures are as high as is permissible for efficient cooling. When this plan is tried for the first time it is not uncommon to find that about double as much water as is necessary is being used in the winter. Efficient and regular cleaning of cooling surfaces will also result in considerable economy of cooling water, and where water containing much suspended matter has to be used it is better to have tubular condensers and coolers with open tops so that the tubes can be brushed out while the plant is operating. The formation of scale in the hot parts must be avoided and it is far easier to deal with scale when it is very thin than when it has been allowed to attain a considerable thickness.

Process Work

For process work, where the water is used in the actual manufacture of products, clean water is essential, and in some case the hardness, softness, or chemical composition of the dissolved salts may be of importance. As regards fire hydrants, an abundant supply at adequate pressure is all that is called for, provided the water is not so dirty that it clogs the pumps.

On any site where town water is available it is as well to have it laid on unless it is very expensive and there is an alternative well supply of equally good quality. Next to the question of cost, the important facts to ascertain about a town supply are whether the maximum quantity required will always be available, whether the supply is subject to interruption for repairs to mains or other reasons, and whether the mains pressure is at all times sufficient to reach the highest point at which the water will be used.

Variable pressure is a nuisance in connection with cooling water, and necessitates constant adjustment of control valves, otherwise waste of water is sure to occur; hence it is always best to feed the factory from an overhead tank. In the smaller factories this can be placed on the roof of the highest building, and in the larger ones a separate water tower is better. Where two sources of water are used a tower with concentric concrete tanks, one for town water and one for cooling water makes a convenient and economical arrangement. Should the town main pressure be insufficient to reach the overhead tank, booster pumps must be used. Economy in cooling water consumption can sometimes be secured in cases where low-boiling liquids have to be cooled or condensed by using the same water a second time on coolers where a higher exit temperature is attainable.

In some distillation work it is important to keep the de-

phlegmator temperature very constant, and in such cases it may be desirable to have a separate constant level tank in the roof of the still building, this tank being fed from the main factory tank through a ball valve so that the head of water on the dephlegmators and condensers is always the same.

All water, including condensed steam, which is liable to corrode wrought iron piping should be distributed in cast iron pipes. Screwed joints may conveniently be used on wrought iron pipes up to 3 in. or 4 in., but above this size it is better to use flanged joints for ease in erection and dismantling for repairs or alterations. It is always well to leave a number of spare branches on supply mains in process buildings.

Information as to the likelihood of finding water by sinking a well can usually be obtained from the well borers, and also from the existence of neighbouring wells. If there seems a good chance of finding an abundant supply of good water it is well worth while putting down a trial bore. Should the permanent water level in a well be fairly near the surface the water may be pumped, but where the level is some way down the air-lift system has much to recommend it, since a much smaller bore can be used than if a deep-well pump is to be put in.

It is not uncommon to find factory engineers in smaller factories where water is taken from a river or canal refusing

to use centrifugal pumps and pinning their faith to the old ram pumps or other type of reciprocating pump on the ground that centrifugal pumps are difficult to prime and are easily clogged with leaves or other floating debris. This is a mistake, for the centrifugal pump has a much higher efficiency than the reciprocating pump and lends itself to direct coupling to an electric motor. Provided that a proper brick or concrete intake channel of ample cross-section to allow a very low velocity of flow, say, 1 to 1.5 feet per second, is put in and provided with at least two screens of small mesh sliding in grooves in the sides of the channel, no trouble should be experienced with clogging of pumps. The pumps should be placed at as low a level as possible, without risking the water level reaching them in times of flood, so as to have as short suction as possible.

Pumps provided with a non-return valve on the rising main can be primed from a small branch on the rising main beyond the non-return valve, but by far the better way is to have a small motor-driven vacuum pump and vacuum receiver to draw the water up into the suction pipe as far as the pump. With this system no foot-valves are required, which is a great advantage as these are nearly always a source of trouble, particularly with dirty water. It is often convenient to start and stop the pumps automatically by means of a float, in the main tank, operating an electrical contact.

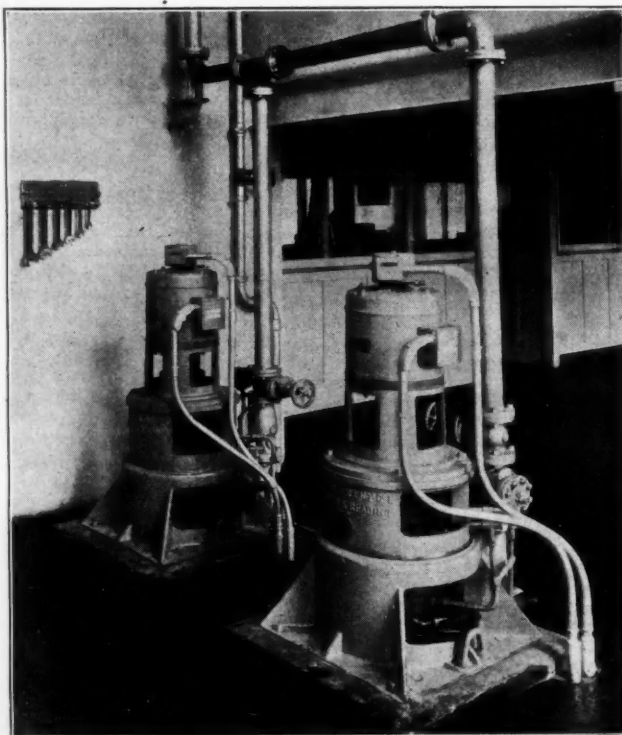
Borehole Pumps for Water Supply

THE value of the centrifugal pump for borehole work is well represented by the installation for the Reading Co-operative Society Dairy, shown in the accompanying illustration. This dairy has one of the most complete and up-to-date milk pasteurisation and cooling plants in Great Britain, which includes two 6-stage "Pulsometer" borehole pumps. Each of these pumps delivers 100 gallons of water per minute when running at a speed of 1,450 r.p.m., the boreholes being sunk to a depth of about 285 feet and 9½ inches in diameter.

The pumps have their own self-contained electric motors at the top, with vertical spindles, being entirely automatic and controlled by a float in an overhead delivery tank of 12,000 gallons capacity, which holds the water. The latter is used for cooling the milk after pasteurisation, in which process the milk is heated by steam coils to 145° F. followed by immediate cooling down to about 40° F. within a few seconds before filling into bottles for delivery. The cold water from the boreholes is passed through a tubular brine and water cooler so that the milk is reduced from 145° F. to 65° F. and then passes through the brine cooled sections, which completes the reduction in tempera-

ture from 65° F. to 40° F. Each of the refrigerator and water cooling sets has a maximum duty of 1,000 gallons of milk per hour. The refrigerators also operate a large storage cooling chamber for the bottles, which is maintained at a constant temperature of 40° F., the installation including all the necessary pipes, valves, brine circulating equipment and other circulating equipment.

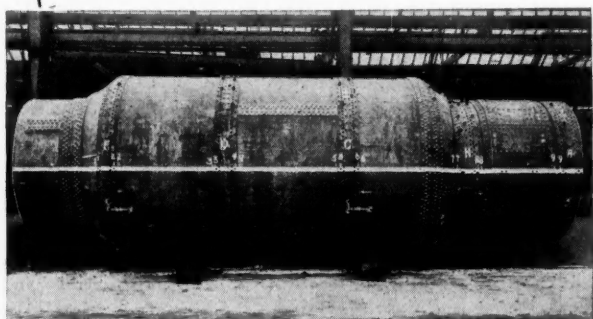
Borehole pumps of the "Pulsometer" make are manufactured in three different types—well pumps, medibore pumps, and propeller pumps, each of which has the same standard suspension pipe, shafting, and bearings. For the Reading installation medibore pumps have been used, operating on the 6-stage principle, with large impellers and diffuser return passages made to correct dimensions, and highly finished to such a degree as to give an efficiency comparable to normal multi-stage pumps. All three types are made in standard sizes with a capacity from 20 to 5,000 gallons of water per minute from depths down to 500 feet, while the drive can be given not only by electric motor of the A.C. or D.C. type, but also by steam turbine, or petrol, oil, or steam engines can be employed with suitable gearing.



These two "Pulsometer" Bore-hole Pumps are installed at the Reading Co-operative Dairy, where large quantities of water are utilised for cooling purposes in the pasteurisation of milk. They deliver 100 gallons of water per minute.

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Safety Researches into Coal Dust Explosions

New Work by the Safety in Mines Research Board

THE relative efficiency of various stone dusts in suppressing coal dust explosions were summarised in last year's annual report of the Safety in Mines Research Board and have been published as S.M.R.B. Paper No. 79. The difference in efficacy of the dusts tested was so great that it became desirable to seek its cause. For this reason tests have been made on two additional dusts, namely, sodium bicarbonate and magnesium sulphate heptahydrate, the results of which are given in the current (1933) report of Safety in Mines Research Board. Under standard conditions of the gallery tests using Silkstone coal dust (85 per cent. passing through a 200 mesh I.M.M. standard sieve) the results of these tests were:—

Incombustible Dust.	Percentage of incombustible dust passing 200-mesh I.M.M.	Percentage of incombustible dust required to suppress inflammation.	Optimum concentration of coal dust (oz. per cu. ft.)
Sodium bicarbonate ..	85	Not less than 67½	—
Magnesium sulphate crystals	82	27½	0.15

The efficacies of three typical dusts having different amounts of water of hydration are also tabulated:—

Incombustible Dust.	Per cent. water of hydration.	Incombustible dust required to suppress inflammation.	
		per cent.	lb. per lb. of coal dust.
Anhydride (CaSO ₄) ..	nil	60	1.50
Gypsum (CaSO ₄ · 2H ₂ O)	22	40	0.67
Magnesium sulphate (MgSO ₄ · 7H ₂ O)	51	27½	0.38

These results support the contention, previously advanced, that an incombustible dust is effective in preventing the propagation of a coal dust explosion mainly by reason of its capacity for the absorption of heat, which is exceptionally great for water, either chemically combined or free. It is difficult, however, to understand the comparative inefficiency of sodium bicarbonate which liberates 11 per cent. of water and 26 per cent. of carbon dioxide on decomposition by heat.

Experiments on the effect of variation in fineness of coal dust and of stone dust on the inflammation of a dust mixture have been made in France and in the United States. Tests in the experimental mine of the U.S. Bureau of Mines, with Pittsburgh coal dust, showed that but 5 per cent. more limestone dust was needed when only 47 per cent. of the limestone passed through a 200-mesh Tyler sieve than when 99 per cent. passed through such a sieve. Last year, however, the Safety in Mines Research Board reported that experiments made in the 4 ft. diameter gallery at Buxton showed that not more than 2½ per cent. more shale or limestone dust was required when only 60 per cent. passed through a 200-mesh sieve (I.M.M. standard) than when 85 per cent. passed it. A further series of tests using coarser limestone (25 per cent. through 200 mesh) has now shown that 20 per cent. more of this coarse dust is required than of the fine dust.

Dispersability of Dusts

Some further progress has been made towards obtaining a suitable measure of the ease with which different incombustible dusts can be raised into the air to form a cloud. It appears that those dusts which are most readily dispersable when the disturbing force is weak are not necessarily so when the force is strong. Hence no single laboratory test can assess the dispersability of a dust under all the conditions of a coal mine. Most of the comparative tests of dusts have been made with a weak disturbing force, since it is under such conditions, *e.g.*, at the start of a firedamp explosion, that the consequences of poor dispersability of an incombustible dust are likely to be most important.

The caking of powders, such as sugar, is commonly prevented by adding small proportions of such materials as magnesium carbonate or starch. Experiments suggest that

the tendency of some stone dusts to cake on exposure to moist, and even to normal, air may be reduced in the same way. Of the materials tried so far, talc (or steatite) has proved the most effective when added to gypsum in small quantities. Absorption of water is generally regarded as the main cause of loss of dispersability of most dusts and results have been obtained which suggest that this is true for each of the dusts examined. On the other hand, there is no relation between the amount of moisture absorbed and the loss of dispersability when comparing different dusts.

Use of Wetting Agents

The nuisance caused by dust in the air of a travelling roadway is sometimes alleviated, where conditions are suitable, by damping the floor. To overcome the difficulty of wetting coal dust adequately with water, various solutions or emulsions have been tried in the past, but with indifferent success. Recently, however, there has been an important development in the production of "wetting agents," for use in other industries, which are so effective as to warrant a study of their possible application in the wetting of coal dust. Such wetting agents when added in small proportion to water enable the water readily to wet materials which otherwise would be wetted only slowly or not at all. During the past two years, examination has been made of the behaviour of two such agents towards the wetting of coal dust and mixtures of coal dust with stone dust. The physical processes involved in the wetting of dusts, however, are complex and the relative importance of one or other phase of the process varies according to the nature both of the dust and of the wetting solution, and even according to the manner in which they are brought together. In taking up the study afresh, a more direct, if somewhat empirical, attack on the problem has been made.

It has been found that sprays of water containing one per cent. of either of the two wetting agents tested are effective in wetting coal dusts or heterogeneous deposits of coal dust and stone dust. The wetted material dries to a caked mass not readily dispersable in the air. Further, once a dust deposit has been thus wetted, new layers of coal dust deposited over a considerable period may be sludged by spraying with water alone, for some of the wetting agent redissolves and diffuses into the fresh dust.

Sodium Bichromate

Increased Japanese Production

DURING the past five years the Japanese production of sodium bichromate has increased to such an extent that the country is more than self-sufficient in this product and is now exporting its surplus production. The heavy requirements of the tanning, dyestuffs, metal plating, and electric battery industries during the past two years have been largely responsible for the development of the Japanese sodium bichromate industry, the 1933 consumption being estimated at approximately 4,500,000 lb. The progress of the Japanese sodium bichromate industry and the recent exports of this chemical from Japan have attracted the attention of the international syndicate of sodium bichromate producers, and representatives of this organisation have recently visited Japan to urge the most important domestic producers to join the syndicate. Almost the entire output of sodium bichromate in Japan is produced by two firms, the Nihon Seiren K.K., which has factories in Tokyo and Osaka, and the Kizaga Seiyaku K.K., Osaka. The Nihon Seiren K.K. now has a new plant under construction adjacent to its present plant in Tokyo. When the new plant is completed, the potential output of sodium bichromate and potassium bichromate by this firm will be about 5,000 metric tons annually, and the output could easily be increased to 7,000 tons if necessary.

Moving Machinery Needs Proper Protection

ACCORDING to the annual report of the Inspector of Factories and Workshops for the year 1933, accidents caused by power transmission machinery totalled 1,066, fatalities having risen from 26 to 35 in comparison with the year 1932. Of the 35 fatal accidents 18 occurred at revolving shafts and 17 were due to driving belts, ropes, pulleys and gearing, the respective figures for non-fatal accidents being 137 and 894.

While fatalities due to shafting are more numerous than those due to belts, etc., it will be noticed that the reverse is the case in regard to non-fatal accidents. In this respect it should be remembered that many of the non-fatal accidents due to belts, etc., often result in less serious injuries. Nevertheless, power transmission machinery accidents are still too numerous and are of serious concern. Probably no other subject has received such careful and sustained effort on the part of the Home Office factory inspectors in their endeavour to make employers, works managers and employees realise the dangers which are present and the vital need for effective and stringent measures being taken in every factory to prevent accidents arising from this cause.

The accompanying illustrations show various applications of wire guards to moving machinery. They were taken at the Home Office Industrial Museum, London, which is a permanent exhibition of accident preventing devices where wire guards form a part of the display. These particular guards were designed and manufactured by Frederick Braby and Co., Ltd., who have made a special study of the subject. Their guards are exceedingly adaptable, and they occupy very little space. Apertures or hinged doors can be provided to give easy access to parts that require lubrication, and the guards can be removed and replaced quite easily if and when a machine has to be repaired. In addition, where possible, without consequent dangers arising, the bottom of the guard

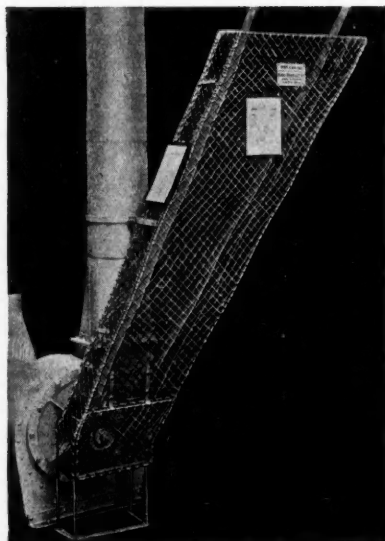
Belt and pulley of this grinding mill are protected against possible hazards arising where the employees are rather careless.



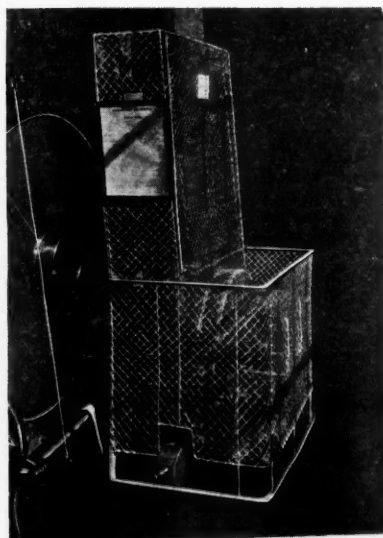
is raised slightly above the level of the floor in order to facilitate sweeping. Such guards are generally made of corrugated diamond lattice of 1 or 1½ inch mesh, the wire being 12 or 10 gauge with a stout rod or angle-iron frame. The complete assembly is also heavily galvanised after manufacture.

This modern method of using wire fencing at once affords a lighter, brighter and more efficient appearance than wood or sheet metal, and it allows every part of the machine—adequately protected against dangerous contact—to be exposed to view so that inspection may be made without the need for removing the guard. Such guards do not harbour dirt.

In connection with fatal shafting accidents the Home Office Industrial Museum has a somewhat grim exhibit which should prove useful in emphasising the dangers involved when moving shafting is approached. Examination of the clothing of the deceased showed that it was some strands of cotton waste protruding from the man's pocket which first caught on the shaft.

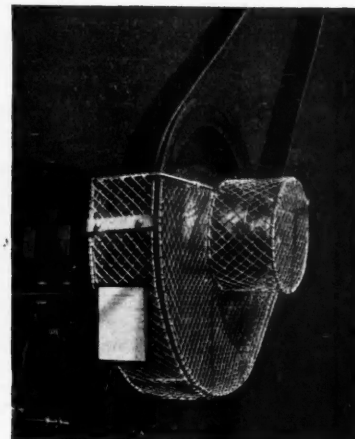


This lattice guard protects the pulley and belting of a fan. It is carried to a height at which the head of the operative would be liable to come in contact with the rapidly moving belt.



Above: Here provision is made for protecting the machine minder in his task of lubricating the moving parts.

Below: A projecting boss or the free end of shafting which projects beyond a pulley demands as much protection as the pulley or belting itself.



The Determination of Formic Acid

A Critique of the Available Methods

By HENRIETTA SNOW HAYDEN

An abstract of a thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Chemistry in the Graduate School of the University of Illinois, 1934.

MANY methods for the determination of formic acid have been proposed. This multiplicity of methods and modifications of each indicate a certain dissatisfaction with previous procedures. It was the purpose of this investigation to evaluate various methods, and to offer suggestions as to the possible sources of error in them. Because of the many complications arising from the determination of formates in mixtures and in concentrated solutions, this research has been confined to approximately 0.1 normal solutions of sodium formate or formic acid.

Mercuric Chloride Methods

The oxidation of formates by mercuric chloride is the basis of many of the researches on this problem. There is (1) the method of Auerbach and Pluddemann,¹ in which the excess mercuric chloride is back-titrated by potassium iodide; (2) Riesser's² method in which the mercurous chloride formed was dissolved in iodine solution, and the excess iodine was back-titrated with sodium thiosulphate; (3) Fincke's³ method of determining the mercurous chloride gravimetrically.

The error in the Auerbach-Pluddemann method is - 3 to - 4 per cent., and is largely due to the formation of the red precipitate of mercuric iodide which indicates the end-point. This appears before the stoichiometric end-point is reached. Koltzoff⁴ gives a factor correction for this error, based on the equilibrium $\text{HgI}_2 \rightleftharpoons \text{HgI}_2 + 2\text{I}$. A control may be used rather than the factor. A slight change in concentration of the final solutions will cause a large error. A negative error of 3 to 4 per cent. was also found in the Riesser method. The main source of error is probably the formation of free mercury which seriously interferes with the back-titration of the iodine with sodium thiosulphate.

Probably the best method for the determination of formates is the Fincke procedure in which the mercurous chloride formed is estimated gravimetrically. A maximum error of 0.5 per cent. may be expected when the conditions for the oxidation of the formate are carefully regulated.

Permanganate Methods.

Lieben⁵ and others have undertaken to determine formates by oxidation with potassium permanganate, reducing the excess permanganate with oxalic acid and then back-titrating the excess oxalic acid with standard permanganate. This procedure was found to be very unsatisfactory, entailing an error as great as 4 per cent. This error is to be expected, due to (1) the loss of formic acid by volatilisation from the acid solution of permanganate, and (2) the decomposition of acidified permanganate.

The direct titration of the formate in a basic solution⁶ is not recommended because the permanent pink colour due to the first excess of permanganate cannot be seen through the brown of the manganese dioxide, even though the solution is heated with a coagulating reagent as sodium acetate. When formates are oxidised in basic solution by potassium permanganate, followed by reduction of the excess permanganate with oxalic acid and the back-titration of the excess oxalic with permanganate,⁷ a maximum error of 3 per cent. is encountered. If more than .05 grams of formate is used, the error may be reduced to 0.5 per cent.

Oxy-Halogen Methods

Several oxy-halogen compounds have been tried as oxidising agents for formates. Rupp's⁸ hypobromite method uses an acidified solution of bromine in sodium hydroxide as the oxidising agent. Excess hypobromite is determined by adding potassium iodide and back-titrating the liberated iodine with sodium thiosulphate. The error of ± 2 per cent. is probably due to loss of bromine, lack of careful regulations

of acidity, and the necessity of a control. Potassium bromate in an acid solution⁹ was used as the oxidising agent. The excess bromate was determined as in Rupp's method. A negative error of 4 per cent. was obtained, due in part to incomplete oxidation of the formate and in part to the necessity of a control.

The most satisfactory halogen method is that of Oberhauser and Hensinger¹⁰ in which the formic acid is oxidised by a standard bromine-potassium bromide solution and the excess of bromine solution determined by titrating with sodium arsenite. An accuracy of ± 1 per cent. was obtained.

Several other methods have been suggested for use with larger amounts of formates, i.e., Wegener¹¹ dehydrated the formate with concentrated sulphuric acid; Fenton and Sisson¹² reduced the formate with magnesium in an acid solution and determined the aldehyde formed by fuchsine-aldehyde reagent. Buil¹³ made use of the refractometer. The titration of formic acid with a standard sodium hydroxide solution is, of course, unquestioned.

Summary of Conclusions

Mercuric chloride is a good oxidising agent for formic acid when used under carefully regulated conditions. The amount of formate can be determined within 0.5 per cent. by the gravimetric determination of the mercurous chloride formed during the oxidation. Potassium permanganate, if used in a basic solution, and the excess permanganate reduced by oxalic acid, then the oxalic acid back-titrated with permanganate, will give a quantitative estimation of formic acid within 3 per cent. Bromine-potassium bromide solution may be used to oxidise formic acid. If the excess oxidising agent is titrated with sodium arsenite, an error within ± 1.0 per cent. may be expected. Other methods are used for solutions of greater concentration than 0.1 normal.

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By-Product Sulphuric Acid in the United States

THE output of by-product sulphuric acid at copper and zinc plants in the United States in 1933, in terms of 60° acid, amounted to 656,102 short tons, of which 301,075 tons were produced at copper plants and 355,027 tons at zinc plants. At zinc plants, 64,984 tons of sulphur were used to supplement the gases derived from the roasting of zinc blende, and 242,493 tons of sulphuric acid were produced therefrom. No sulphur was used at copper plants. In 1932, 600,334 tons of by-product sulphuric acid were produced. Of this amount, 258,994 tons were recovered at copper plants and 341,340 tons at zinc plants. Sulphur amounting to 65,510 tons was used at zinc plants for the recovery of 244,644 tons of sulphuric acid.

Synthetic Raw Materials

Production Campaign in Germany

THE official campaign for making Germany independent of foreign raw materials by devising chemical and technical surrogates has attracted much attention on the Continent of Europe. The campaign under way embraces textiles materials, non-ferrous metals, fats and oils. In part it concerns the devising of real surrogates, in part merely substitution of materials, and in part increased home production of natural materials which are at present imported.

At a recent congress of German chemists at Cologne, at which the textiles surrogates campaign was presented in a rosy light, Professor Leysieffer admitted that none of the artificial wools can resemble the natural product. He spoke instead of cloths woven out of substances called zellon and galalith, and even out of "condensation products of phenol and uric acid." Economy in consumption of natural wool is being attained, at the expense of quality, by mixing it with surrogates. "Vistra," one of these surrogates, is a product of the rayon industry, being turned out by a somewhat similar process. It is claimed that "Vistra" is not a surrogate at all, any more than rayon is a silk surrogate. "Woolstra," a mixture of natural wool and of "Vistra," is to be marketed. It has certain deficiencies, will not wash satisfactorily, and is not much cheaper than pure wool.

In the replacement of imported non-ferrous metals nothing has been achieved technically. Two ordinances in the past few weeks have forbidden in various industries (including part of the electro-technical) the use of copper, tin and quicksilver. Aluminium, which is to replace copper in the electrical branch, must be mainly manufactured from imported bauxite. The problem of benzine import has been partly solved by a law compelling the admixture of home-distilled spirits in motor fuel. The production of benzine by hydrogenation, and of benzol by the cokeries, is increasing; but the latter has natural limits and the former is uneconomic, being sustained only by State measures.

Wholly fantastic plans, such as the direct use of methane gas (from the Ruhr industry) for automotive propulsion, are also advertised. The separation of this gas from other industrial gases is very costly.

Last year, the Government undertook to pay owners of oil-mills 50 marks per 200 metric lb. for oil produced from home-grown seeds. This resulted in an increase of the area under rape and other oil-plants by nearly 500 per cent. At the Cologne Chemists' Congress, the home production of soya beans (of which Germany imports 1,000,000 tons annually), was recommended.

Italian Chemical Industry

Increased Production Reported for 1933

FINAL production statistics of chemicals made in Italy in 1933 confirm earlier estimates of increased output and consumption for many products. Production of sulphuric, hydrochloric, and nitric acids in 1933 was considerably larger than for 1932 and 1931, but still considerably under the 1930 and 1929 figures. Practically all the industrial chemicals for which separate figures are given recorded improvement in 1933 over earlier years. Producers of electrolytic caustic soda reported increasing difficulty in competing with domestic Solvay soda and the Russian product. Domestic bromine and iodine from brine continued to supply a good part of Italian consumption, but production of synthetic camphor declined. There was a marked increase in output of methanol, 95 per cent. of which was synthetic. The dyestuffs market showed a considerable improvement over 1932, with increased sales estimated at 15 per cent.; domestic production covered about 83 per cent. of consumption volume. Output of paints and varnishes was estimated at 24,600 tons, compared with 21,300 tons in 1932. Superphosphates, after a very small output in 1932, were up to 1,000,000 tons. Production and consumption of nitrogenous fertilisers, with the exception of a slight sag from 1930 to 1931, have increased every year since 1929. In contrast to the improvements in these branches of the chemical industry, the pharmaceutical and medicinal specialties industry reported an unfavourable year in 1933, with a marked falling-off in sales from 1932.

World Phosphate Trade

Increased Consumption Reported for 1933

AN interesting survey of the European phosphate market in 1933 is given in the annual report of the "Office Cherifien des Phosphates," the Morocco monopoly, which plays a leading part in the European production. For the first time for several years, the report is able to point out a perceptible recovery in the international market.

An increase in world consumption from 6,800,000 tons to 8,100,000 tons was registered last year. European consumption rose by 750,000 tons and consumption in the United States by 550,000. In Australia, Africa and Asia no changes of importance occurred. The increase in consumption is due partly to the slight improvement in agricultural business and partly to the fact that consumption has been stimulated by lower prices. As regards European countries, the increase in consumption was very irregular. While demand showed little change in Great Britain, France, Switzerland, Holland, Belgium, Spain and Portugal, an increase was witnessed in Germany (251,000 tons), Italy (214,000 tons), Poland, Latvia, and a few other countries.

Production was influenced mainly by the growth of the Russian industry. The increasing importance of the Russian production is shown by the fact that of 760,000 tons of phosphate produced in Europe last year, Russia's share was 676,000 tons. North African supplies increased in 1933 by 200,000 tons, to 3,400,000 tons, of which 1,648,000 tons (an increase of 48,000 tons) came from Tunis, 570,000 tons (15,000 tons increase) from Algiers, 1,015,000 tons (127,000 tons increase) from Morocco, and 187,000 tons (6,000 tons increase) from Egypt.

Phosphate shipments from the United States to Europe, declining substantially in 1932, rose in 1933 by 250,000 tons, to 750,000 tons as a consequence of America's increased competitive power through the devaluation of the dollar.

South African Chemical Notes

Manufacture of Alcohol from Maize

ALL hope of South Africa starting a maize alcohol scheme seems now to be at an end. The Minister of Commerce and Industries damned the idea by detailing the costs of the smallest scheme before him. Under this scheme 2,560,000 bags of maize were to be used, bought at a contract price of 7s. a bag. From this the company would try to produce 28,000,000 gal. of power alcohol, 3,500,000 gal. of tractor fuel, 150,000 gal. of fusel oil, 745,000 gal. of maize oil, 1,500,000 bags of dry distillers' grain, and 150,000,000 lb. dry ice. At certain stations the company would have to charge 1s. 8d. per gal. for its petrol, 1s. 1d. per gal. for its tractor fuel, 4s. per gal. for its fusel oil at Durban. It cost 11½d. per gal. to produce power alcohol at the factory, and to this must be added the cost of petrol, distribution and other costs. Petrol could be landed in the country at 4d. per gal. Taking this into consideration and the loss of Customs' dues the Minister was not hopeful about the industry. The Government, at any rate, could offer it no assistance.

Paint and Varnish Imports

THE importation of paint is now definitely on the upward grade, and this improvement is in value as well as in quantity, for many of the more expensive brands of paint are being brought more largely than was usual twelve months ago. The demand for sun-resisting and rain-resisting paints is steady. As the locally manufactured paints do not always fulfil this need there is a steady demand for the best brands of British paint, especially for the better type of work. The local industry is advancing. There is even a factory in Southern Rhodesia, yet there has been no proportionate fall in the imports of paints, varnishes and distempers from Great Britain, which is the largest and most consistent exporter of such products to Southern Africa. In the Union there seems to be a definite prejudice in favour of red and green paints for roofing and shutters, but for doors and window-frames brown is more often used.

Continental Chemical Notes

SYNTHETIC RESIN AND VARNISH MANUFACTURE has now been commenced by the Budapest firm, Julius Benedek.

A LARGE PAPER FACTORY is in course of construction on the Gulf of Ismit, in Turkey, under German technical direction. The equipment will also be provided by German firms.

THE THYLOX PROCESS for sulphuretted hydrogen elimination from coal gas, whereby elementary sulphur is deposited, has been recently adopted in several large Ruhr gas-making plants.

DETERMINATION OF MOISTURE CONTENT OF WOOD is described in a recent issue of the "Siemens-Zeitschrift." The method is based upon the direct proportionality between the ohmic resistance of wood and its moisture content.

THE POLISH OIL INDUSTRY has devoted attention in the last two years to the production of vegetable oils formerly imported in the finished state. Their efforts are reflected in the recently published import figures for manufactured oils ("Chem.-Zeitung," August 22) which dropped from 50,588 tons in 1929 to 6,000 tons in 1933.

STYROL AND ITS ANALOGUES, which are applied in the polymerised form in the plastics industries, can be made by heating a chloro-aryl ethane with acids which are less volatile than hydrochloric acid. Examples are boric, monochloroacetic and salicylic acids. Owing to its resinifying action, sulphuric acid is excluded (German Pat. 599,166).

ATTEMPTS TO CONVERT LIGNITE into a fertiliser by reaction with nitrogen have been carried out in the Kaiser Wilhelm Institute for Coal Research. A report of the biological department of the Institute ("Chem.-Zeitung," August 22) refers to the great superiority of the new soluble coal derivatives in admixture with the usual artificial fertilisers over the latter alone.

A RUSSIAN WOOD SACCHARIFICATION FACTORY now claims to be securing a yield of 45 per cent. wood sugar. A minimum annual output of 2,500 tons is essential for profitable operation. The Soviet Government proposes to erect ten similar factories in 1935 which will operate Russian processes, negotiations for the purchase of the German Scholler patents having broken down ("Chem.-Zeitung," August 18).

THE RECENT ANNOUNCEMENT of the discovery of a new element of high atomic weight, to which the name of bohémium was given, now turns out to have been made in error. In a communication to the "Chem.-Zeitung," August 22, the director of the State radium factory of St. Joachimstal, Czechoslovakia, explains that the presence of a large proportion of tungsten in the material led to deceptive analytical results.

SYNTHETIC DIAMONDS weighing $\frac{1}{4}$ carat and about ten times as long as those obtained by Moissan are claimed to have been produced by a Viennese inventor. A mixture of iron filings, blast furnace slag, amorphous carbon, and liquid or solid carbon dioxide is subjected to a pressure of 5,000 atmospheres at 900 to 1,000° C. The pressure is then momentarily increased to 15,000 atmospheres prior to cooling and complete release of pressure (German Pat. 589,144).

THE SICILIAN CALCIUM CITRATE INDUSTRY is again reported to have experienced a poor season. According to the "Chem.-Zeitung," August 24, this is principally ascribed to the antiquated and costly equipment and processes, as a result of which the Messina Chamber of Agriculture, which controls the entire citrate production, is taking steps to introduce improved methods. It is intended, above all, to increase the purity of the citrate which has been very low in the past in the case of the small factories and which has contributed to the collapse of prices. In the opinion of the conference recently called to discuss suitable measures, the Sicilian calcium citrate industry should be able to compete with the pure products obtained by synthetic methods.

A CASEIN ARTIFICIAL HORN FACTORY, with a reported annual capacity of 2,600 tons has started operation at Dnjepropetrovsk, in Russia.

SUGAR FOR THE PREPARATION OF DRY TANNING EXTRACTS is now exempt from the French excise duty if denatured with 50 per cent. magnesium sulphate or 10 per cent. sodium metabisulphite.

THE REGION OF THE CHIEMSEE in Bavaria is to be systematically examined for its mineral oil resources and for its mineral wealth in general by a company recently registered in Munich with a capital of 20,000 marks.

AMYL AND BUTYL ACETATES are now being manufactured by a new Czecho-Slovakian producer in a disused malt factory in Olmütz. The end of the year will see the dissolution of the existing price and output controlling cartell of ethyl, butyl and amyl acetates producers.

METHANE-CONTAINING GASES which are by-products of the cracking of coke oven acids in the Ruhr mining industry and in the Central German synthetic motor spirit factories, have proved satisfactory as fuel for passenger motor vehicles ("Chem.-Zeitung," August 22).

THE ZONGULDAK COAL BASIS has been selected as the centre of the future Turkish chemical industry. Subsidiaries of the Sumer Bank will produce caustic soda, chlorine and sulphuric acid, while the erection of a coking plant is also planned ("Chemische Industrie," August 25).

A VALUABLE LUBRICANT is reported to be derived from Kogasin II (a by-product of the Fischer benzene synthesis) by chlorination and condensation. The new product is water-white and markedly resistant to oxidation ("Chem.-Zeitung," August 25).

Sodium Metaphosphates

Recent Progress in Production and Uses

A SERIES of sodium metaphosphates, ranging from tri- to hexa-, is produced by heating mono-sodium phosphate or acid sodium pyrophosphate at certain temperatures ranging from 250° to 700° C. These salts differ widely in chemical and physical properties.

In the course of a general review of recent progress in the production and application of alkali phosphates, a writer in the "Chemiker-Zeitung" (August 22) states that greatest interest in connection with metaphosphates now attaches to the hexa salt which has been applied as a plasticiser in the manufacture of processed cheese and as a water purifying agent. The former application is based upon its ability, at higher temperatures, to convert the casein-fat-water system of cheese into a fluid colloid condition (German Patents 557,096, 564,365, etc.). Citric acid was formerly largely used for this purpose in the German dairy industry but is now stated to have been displaced by the sodium metaphosphates in conjunction with the pyro- and orthophosphates. The water purifying application is based upon a reaction with soluble lime salts, calcium phosphate being formed which re-dissolves in the presence of an excess to form a complex salt which is no longer capable of reacting with calcium precipitating agents. Consequently, hard water which has been treated with sodium metaphosphate is completely softened without any precipitation of the salts responsible for hardness.

The metaphosphate has recently found application in the laundering and textiles industries because of its property of re-dissolving precipitated lime and magnesium soaps which cause the annoying yellowing and embrittling of laundered goods. As before, re-formation of the sodium soap takes place as well as the complex soluble sodium-calcium-metaphosphate. Other related uses of sodium metaphosphate are in the purification of industrial feed water and in the cleansing of glass vessels in conjunction with alkaline detergents.

Inventions in the Chemical Industry

Patent Specifications and Applications

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Acetic and other Aliphatic Acids

Acetic and other aliphatic acids are made by oxidising an alcohol with an oxidising agent capable of electrolytic regeneration, such as potassium dichromate or permanganate, separating the acid by means of a solvent such as ethyl acetate or a mixture of benzene and methyl ethyl ketone and reoxidising the spent oxidising agent electrolytically. The extract is distilled by known azeotropic methods to obtain the anhydrous acid. The alcohols mentioned are ethyl and propyl alcohols, and it is stated that when the higher alcohols are treated, acids of lower molecular weight are obtained, by cleavage of the molecule. See Specification No. 410,373 of Usines de Melle.

Complete Specifications Open to Public Inspection

COLORING OXIDE FILMS on aluminium or on its alloys.—Soc. of Chemical Industry in Basle. Feb. 16, 1933. 3884/34.

ETHYLENE AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. Feb. 16, 1933. 5235/34.

POLYMERISING monomeric aldehyde sugars (aldoses).—Holzhelyse A.-G. Feb. 16, 1933. 5246/34.

CONTINUOUS DIRECT RECTIFICATION of crude petroleum or other hydrocarbons.—E. A. Barbet. Feb. 16, 1933. 5247/34.

CYCLOC ESTERS, manufacture.—E. I. Du Pont de Nemours & Co. Feb. 18, 1933. 5422/34.

SODIUM and other like metal, production.—E. I. Du Pont de Nemours and Co. Feb. 17, 1933. 5423/34.

NATURALLY OR ARTIFICIALLY GRANULATED, activated, or unactivated anhydrous sodium peroxide.—G. F. Jaubert. Feb. 20, 1933. 5630/34.

ORGANIC SILVER COMPOUNDS, manufacture of water-soluble.—Dr. K. Roth. Feb. 20, 1933. 5639/34.

Specifications Accepted with Dates of Application

NITROGENOUS CONDENSATION PRODUCTS of the anthraquinone series, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Jan. 13, 1933. 415,069.

LIQUIDS CONTAINING VITAMINS, distillation.—British Drug Houses, Ltd., F. H. Carr and W. Jewell. Jan. 17, 1933. 415,088.

CARBOHYDRATE DERIVATIVES, manufacture.—H. Dreyfus. Feb. 14, 1933. 415,052.

ZINC CHLORIDE, manufacture.—Grasselli Chemical Co. and A. W. Wahlgren. Feb. 15, 1933. 415,057.

PRESERVATION OF RUBBER.—E. I. Du Pont de Nemours and Co., I. Williams and A. M. Neal. Feb. 15, 1933. 415,073.

RUBBER LATEX, treatment.—A. H. Stevens (Rubber Research Institute of Malaya). Feb. 23, 1933. 415,133.

VULCANISATION OF RUBBER.—E. I. Du Pont de Nemours and Co. Feb. 25, 1932. 415,135.

CATALYTIC OXIDATION of ketones.—J. Y. Johnson (I. G. Farbenindustrie). March 17, 1933. 415,172.

EXPLOSIVE COMPOSITIONS of the character of dynamite, manufacture.—E. I. Du Pont de Nemours and Co. Feb. 23, 1932. 415,136.

HYDROGENATION OF FATS and fatty oils.—J. Y. Johnson (I. G. Farbenindustrie). April 12, 1933. 415,203.

STABILISING FATS and/or oils, and the improved product resulting therefrom, methods.—Swift and Co. Aug. 15, 1932. 415,205.

PRODUCTION OF STARCH and glutinous materials, method.—W. J. Bellingham. Dec. 8, 1932. 415,235.

GLUE AND GLUE PREPARATIONS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). June 24, 1933. 415,238.

CYCLOC α -CYANKETIMIDES and cyclic α -cyanketones, process for the manufacture.—Schering-Kahlbaum A.-G. Aug. 15, 1932. 415,259.

LUBRICATING OILS.—J. Y. Johnson (I. G. Farbenindustrie). Dec. 12, 1932. 415,065.

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CARBON TETRACHLORIDE, manufacture.—Albright and Wilson, Ltd., S. Barratt, J. S. Pedder. 24252.

TITANIUM COMPOUNDS, preparation.—S. F. W. Crundall, P. Spence and Sons, Ltd. 24059.

PHENOLS, manufacture.—S. Deichsel. 24021.

SULPHURIC ACID DERIVATIVES, manufacture.—Deutsche Hydrierwerke. (Germany, Aug. 19, 1933.) 24027.

AZO COMPOUNDS, and their application.—E. I. Du Pont de Nemours and Co. (United States, Aug. 17, 1933.) 23744.

(United States, Nov. 11, 1933.) 23745.

VULCANISATION OF RUBBER.—E. I. Du Pont de Nemours and Co. (United States, Aug. 22, 1933.) 24209.

AMINO-CARBOXYLIC ACIDS OF CAPILLARY ACTION, manufacture.—W. W. Groves (I. G. Farbenindustrie). 24097.

AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. 23648.

AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, Aug. 18, 1933.) 23670.

PHENOLS, manufacture.—I. G. Farbenindustrie. 24021.

TRIACENE COMPOUNDS AND AZODYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, Aug. 26, 1933.) 24242. (Germany, Aug. 26, 1933.) 24243. (Germany, Jan. 26.) 24244, 24245.

CARBONISATION OF SOLID MATERIALS.—Illingworth Carbonisation Co., Ltd. 23812. S. R. Illingworth.

TRIARYLMETHANE DYESTUFFS.—Imperial Chemical Industries, Ltd., F. W. Lynch, H. H. Stocks. 23704.

SUBSTANCES FOR PICKLING, ETC., METALS.—Imperial Chemical Industries, Ltd. (United States, Aug. 17, 1933.) 23747.

STABLE SOLUTIONS OF ARYLAMIDE OF β -HYDROXYNAPHTHOIC ACIDS.—Imperial Chemical Industries, Ltd., L. P. Rendell, J. L. Moilliet. 28961.

DESTRUCTIVE HYDROGENATION OF HEAVY OILS.—Imperial Chemical Industries, Ltd., International Hydrogenation Patents Co., Ltd. 24063.

ALKYLENE FLUORHYDRIENS, production.—J. Y. Johnson, I. G. Farbenindustrie. 24213.

VAT DYESTUFFS.—J. Y. Johnson, I. G. Farbenindustrie. 24214.

SEPARATION OF CRESOLS FROM LIQUID PHENOLIC MIXTURES.—Monsanto Chemical Co. (United States, Nov. 25, 1933.) 23776.

DESTRUCTIVE HYDROGENATION OF COAL dispersed in oil.—H. E. Potts, International Hydrogenation Patents Co., Ltd. 24062.

THERMOPLASTIC COMPOSITIONS.—H. E. Potts, Shawinigan Chemicals, Ltd. 23830.

SULPHURISED DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. (Switzerland, Aug. 23, 1933.) 23875.

DYEING ACETATE ARTIFICIAL SILK.—Soc. of Chemical Industry in Basle. (Sept. 20, 1933.) (Switzerland, Sept. 20, 1932.) 24098.

ALKALI METAL TITANATES, manufacture.—Titanges. (Germany, Aug. 22, 1933.) 24129.

Institute of Fuel

Change of President-Elect and Forthcoming Arrangements

IN April of this year Sir John Cadman, D.Sc., was elected president of the Institute of Fuel, dating from the year commencing October, 1934. It was originally arranged that he should give his presidential address in London on October 17, to be followed by the Melchett Lecture and the presentation of the Melchett Medal at the annual dinner in the evening of the same day.

Owing to a change in Sir John's programme, that date was subsequently postponed until January 10, 1935. A still further alteration in his programme has had to be made just recently, the effect of which is that it will be quite impossible for him to be in England until February. It was, therefore, decided, with Sir John's concurrence, to postpone his term of office as president until the year commencing October, 1935, and that Sir Harry McGowan, chairman of the Imperial Chemical Industries, Ltd., should be invited to become president as from October, 1934, which invitation he has accepted.

Sir Harry McGowan will therefore be the president of the Institute of Fuel for the year commencing October, 1934, and he will give his presidential address at a meeting to be held in London at 11.30 a.m. on Monday, November 12. The Melchett Lecture will be given by Dr. Bergius at 2.30 p.m. on that day, to be followed by the annual dinner, dance and cabaret, at the Connaught Rooms, Great Queen Street, W.C.2, at 6.45 for 7.15 p.m., the Melchett Medal being presented to Dr. Bergius immediately following the dinner.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

OWING to the holiday season business in the chemical markets is still rather quiet, but is fairly satisfactory for the time of year, and the tone is steady. With the approach of autumn recovery is anticipated and there are indications that there will be an improvement in values before the end of the year. Industrial chemicals have been in fair demand and prices remain practically unchanged. Good business has been transacted in formic and oxalic acids, formaldehyde and sodium hyposulphite, and a fair interest has been shown in acetic acid, and ammonium chloride. Arsenic, barium chloride, Epsom salts and sodium sulphide are dull items. The coal tar products market is rather quiet, but there is a good demand for creosote oil, and cresylic acid is active. A better inquiry for pitch has continued, but up to the present the actual number of orders placed has not been large. Deliveries of refined coal tar are now decreasing. Business in pharmaceutical preparations has been limited, but the market is steady. There is a good demand for benzoic acid and cream of tartar, and aspirin, bromides, citric and tartaric acids are active. Business in vanillin shows some improvement. The phenacetin market is irregular and salol is a dull item. The essential oils market has been slow.

LONDON.—The London chemical market continues on quiet steady lines with the demand of fair average volume. Prices continue firm and unchanged. There is little change to report in the coal tar products market, prices remaining unaltered from last week.

MANCHESTER.—Reports as to trading conditions on the Manchester chemical market during the past week has been rather disappointing, although traders take the view that the slackness may still be largely attributed to the holiday influences, a number of important industrial areas in Lancashire taking their annual stoppages this week. On the whole, however, allowing for this factor, the movement of supplies into consumption, more particularly of the heavy materials, has been reasonably satisfactory, although not much new business of importance is being placed just now. There has been little change in the price position and the outlook with regard to most products from

this point of view is for a continuation of the steady conditions that have characterised the market for so long. In the case of the by-products slightly easier quotations are being indicated for carbolic acid and one or two other lines and in only one or two instances is buying interest at all satisfactory.

SCOTLAND.—Business is still very slow in the Scottish market.

Price Changes.

Coal Tar Products.—CARBOLIC ACID crystals, Manchester, 7½d. lb.; crude, 1s. 10d. per gal.; TOLUOL, 90 per cent., 2s. per gal.; pure, 2s. 3d.; XYLOL, commercial, 2s. per gal.

Scotland.—BARIUM CHLORIDE, £10 10s. per ton; CARBON TETRACHLORIDE, £41 to £43 per ton, drums extra; CREAM OF TARTAR, £4 2s. per cwt., less 2½ per cent.; FORMALDEHYDE, 40 per cent., £25 to £28 per ton; RED LEAD, £24 to £26 per ton, less 2½ per cent.; SODIUM HYPOSULPHITE, pea crystals, £14 10s. per ton; commercial £10 5s.; SULPHUR, £8 to £9 per ton; SULPHURIC ACID, 140° Tw., spot, £8 10s. per ton; ZINC SULPHATE, £10 10s. per ton.

All other prices remain unchanged.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech., 40%, £29 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £29 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech., 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £25 10s. per ton; crystal, £26 10s.; powdered, £27 10s.; extra finely powdered, £29 10s. packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—9d. per lb. less 5%.

ACID, CRESYLIC.—97/99%, 1s. 8d. to 1s. 9d. per gal.; 98/100%, 2s. to 2s. 2d.

ACID, FORMIC.—LONDON: £43 10s. per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, according to district and quality. SCOTLAND: 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £53 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—LONDON: 1s. per lb. SCOTLAND: B.P. crystals, 11d., carriage paid. MANCHESTER: 1s. 0½d.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £26 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.

ARSENIC.—LONDON: £16 10s. c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £20 10s. to £21 ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton. SCOTLAND: £10 10s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 in 5/6 cwt. casks for contracts over 1934/1935.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—2s. 7d. to 2s. 11d.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—¾d. to 5d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10½d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON: £4 2s. 6d. per cwt. SCOTLAND: £4 2s. less 2½ per cent.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £26 per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. per lb. for quantities not less than 28 lb., increasing to 8s. 4d. per lb. for quantities less than 4 lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34; brown, £31 10s.

LEAD, NITRATE.—£28 per ton.

LEAD, RED.—SCOTLAND: £24 to £26 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £37 10s.

LITHOPONE.—30%, £17 10s. to £18 per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

METHYLATED SPIRIT.—61 O.P. Industrial, 1s. 6d. to 2s. 1d. per gal. Pyridinised industrial, 1s. 8d. to 2s. 3d. Mineralised, 2s. 7d. to 3s. 1d. 64 O.P. 1d. extra in all cases. Prices according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—8½d. to 9d. per lb. without engagement.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £37 10s.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5½d. LONDON: 5d. per lb. with usual discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99½/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb. for quantities not less than 28 lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9½d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: Commercial, 8½d.; B.P., 9½d.

POTASSIUM PRUSSIAN.—LONDON: 8½d. to 8½d. per lb. SCOTLAND: Yellow spot material, 8½d. ex store. MANCHESTER: Yellow, 9½d.

RUPRON (MINERAL RUBBER).—£15 10s. per ton.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels.

SODA ASH.—58% spot, £5 15s. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid 76/77% spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77%, £14 10s. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£22 per ton. LONDON: £23.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lb. net for spot lots and 4d. per lb. with discounts for contract quantities. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.

SODIUM BISULPHITE POWDER.—60/62%, £18 10s. per ton d/d 1-cwt. iron drums for home trade.

SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 per ton.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £15.

SODIUM META SILICATE.—£16 per ton, d/d U.K. in cwt. bags.

SODIUM IODIDE.—B.P., 6s. per lb. for quantities not less than 28 lb.

SODIUM NITRITE.—LONDON: Spot, £18 to £20 per ton d/d station in drums.

SODIUM PERBORATE.—LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSIAN.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5½d. ex store. MANCHESTER: 4½d. to 5½d.

SULPHUR.—£9 15s. to £10 per ton. SCOTLAND: £8 to £9.

SODIUM SILICATE.—140° Tw. Spot £8 per ton. SCOTLAND: £8 10s.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption. Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.

SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.

SULPHATE OF COPPER.—MANCHESTER: £14 5s. per ton f.o.b.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 3s. 11d. to 4s. 1d. per lb.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.

ZINC SULPHIDE.—11d. to 1s. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 8½d. to 8½d. per lb.; crude, 60's, to 2s. 2½d. per gal. MANCHESTER: Crystals, 7½d. per lb.; crude, 1s. 10d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 6d.; dark, 95/97%, 1s. 3d. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.

BENZOL.—At works, crude, 9d. to 9½d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 6½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 4d. to 4½d. per gal. f.o.r. Home, 3½d. d/d. LONDON: 3½d. f.o.r. North; 4d. LONDON. MANCHESTER: 3½d. to 4½d. SCOTLAND: Specification oils, 4d.; washed oil, 4½d. to 4½d.; light, 4½d.; heavy, 4½d. to 4½d.

NAPHTHA.—Solvent, 90/100%, 1s. 6d. to 1s. 7d. per gal.; 95/100%, 1s. 7d. to 1s. 8d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 8½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/100%, 1s. 3d. to 1s. 3½d.; 90/100%, 11d. to 1s. 2d.

NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PITCH.—Medium soft, 57s. 6d. per ton, in bulk, at makers' works. LONDON: £3 per ton f.o.b. East Coast port for next season's delivery.

PYRIDINE.—90/140, 7s. 6d. to 9s. per gal.; 90/180, 2s. 3d. per gal.

TOLUOL.—90%, 2s. per gal.; pure, 2s. 3d.

XYLOL.—Commercial, 2s. per gal.; pure, 2s. 3d.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 8d. per lb.

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.

BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.

BENZIDINE HCL.—2s. 5d. per lb.

p-CRESOL 34.5° C.—2s. per lb. in ton lots.

m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.

DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROBENZENE.—8d. per lb.

DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 0½d.

DINITROCHLOROBENZENE, SOLID.—£72 per ton.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.

α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.

β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags.

α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.

β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.

o-NITRANILINE.—3ss. 11d. per lb.

m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.

NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.

o-TOLUIDINE.—9½d. to 11d. per lb.

p-TOLUIDINE.—1s. 11d. per lb.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—£6 14s. 6d., September £6 16s., October £6 17s. 6d., November £6 19s., December £7, January, 1935, £7 2s., February £7 3s. 6d., March/June £7 5s. for neutral quality basis 20.6 per cent. nitrogen delivered in 6-ton lots to farmer's nearest station.

CYANAMIDE.—September £6 16s. 3d., October £6 17s. 6d., November £6 18s. 9d., December £7, January, 1935, £7 1s. 3d., February £8 2s. 6d., March £7 3s. 9d., April/June £7 5s., delivered in 4-ton lots to farmer's station.

NITRATE OF SODA.—£7 12s. 6d. per ton for delivery up to June, 1935, in 6-ton lots carriage paid to farmer's nearest station for material basis 15.5 per cent. or 16 per cent. nitrogen.

NITRO-CHALK.—£7 5s. per ton for delivery upto June, 1935, in 6-ton lots carriage paid to farmer's nearest station for material basis 15.5 per cent. nitrogen.

(For Latest Oil Prices see page 203.)

News from the Allied Industries

Non-Ferrous Metals

WORLD CONSUMPTION OF TIN increased slightly during the first six months of the present year, according to the August bulletin of the International Tin Research and Development Council. Consumption this year has totalled 58,774 tons, compared with 58,394 tons for the first six months of 1933.

Iron and Steel

IN CONNECTION WITH THE FINANCING of the extensions to the Cardiff works of British (Guest, Keen, Baldwins) Iron and Steel Co., it is understood that the company has just placed £2,032,000 of 4 per cent. debenture stock with the Bankers' Industrial Development Co., of which the Governor of the Bank of England is chairman. There is no question of a public issue. The company was formed in 1930 to amalgamate the heavy iron and steel interests of Baldwins, Ltd., and Guest, Keen and Nettlefolds, and the capital is held by the two controlling companies. The Cardiff extensions are expected to be completed early in 1936.

BRIGHTER CONDITIONS have characterised the iron and steel markets, according to the official report of the London Iron and Steel Exchange. Inquiry has been more active, and merchants and consumers have shown a greater interest than for some weeks past. The demand for pig-iron has been principally confined to small parcels, and many of the important consumers have covered their requirements for some distance ahead. Export trade in pig-iron also has shown signs of expanding, but strong Continental competition is met with in most of the overseas markets. Steady conditions continue in semi-finished steel. The market has become more active, and prices are firm in spite of competition from imported Continental material. In finished steel there has been some increase in buying on home account.

Tanning

CONDITIONS IN THE TANNING INDUSTRY HAVE DETERIORATED during the last month. Shoe manufacturers have been quieter than for years past. A large Continental chrome leather manufacturer has reduced his prices all round to stimulate export trade to this country, and British chrome tanners look like being badly hit. Cheaper leathers are in greater demand and coloured linings and suedes are selling better. The increasing price of cod oil is stimulating inquiries for substitutes both for the straight fish oil and the various sulphonated oils manufactured therefrom. The export figures for the first six months of this year show a serious decline in sole leather. Semichrome gloving leathers have been in brisk demand and increased quantities of chromium salts have been required. The old alum process for gloving leather is rapidly being supplanted by the chrome tannage.

Sugar

THE SUGAR MILLOWNERS' CONFERENCE held at Calcutta has resolved to establish a central marketing board in India for the sale of sugar, in case factories representing 75 per cent. or more of the total sugar production of the U.P., Bengal and Bihar join it. Zone committees will be appointed in various areas to help the marketing board. The railways are being urged to help the marketing of sugar by the introduction of a lower freight rate. The conference appointed a sub-committee for the purpose of fixing the standard quality of crystals and crushed sugar.

THE INTERNATIONAL SUGAR COUNCIL, which is supervising the Chadbourne agreement, is moving their headquarters from The Hague to Brussels on September 1, as the new president, M. Beauduin, who was elected in succession to Mr. Powell, is domiciled at Brussels.

From Week to Week

MR. HOWARD SPENCE, of Ainsdale, Southport, chairman of Peter Spence and Sons, Ltd., of Manchester, died on August 24.

MR. HUBERT ARUNDEL, of Gelli Gynan Hall, Llanarmon, near Mold, North Wales, a director of Cooper, McDougall and Robertson, Ltd., manufacturers of sheep dips, insecticides, etc., left £69,055.

MR. LEWIS B. JONES, one of the vice-presidents of the Eastman Kodak Co., died suddenly at his home at Rochester, New York, on August 25. Mr. Jones, who was 68 years old, had been director of sales of the Eastman Kodak Co. for many years.

DURING THE FIRST SIX MONTHS of the present year the Irish Free State imported chemicals, drugs, perfumery, dyes and chemical fertilisers to the value of £704,985, as compared with £723,050 in the corresponding period of last year.

MR. FRANK J. REES, J.P., of Llanelly, one of the leading steel manufacturers in South Wales, died suddenly at Tenby, on August 27, aged 54. Mr. Rees was managing director of the Llanelly Steel Co. He was a member of the National Committee appointed two years ago to prepare a scheme for the reorganisation of the iron and steel industry.

MR. SYDNEY F. READING, of North Wembley, secretary of the Compressed Paper Co., Ltd., is president and chairman of the Tamar Valley Canning Co., Ltd., which has just been formed, with a capital of approximately £150,000, to can and bottle fruits, vegetables and other food products at a factory which is to be erected in the neighbourhood of Callington, Cornwall.

ONE OF THE LARGEST MERGERS in the American steel industry for a number of years—involving the Republic Steel Corporation, the third largest producer in the United States, and the Corriggan, McKinney-Steel Co.—has been approved by a joint meeting of the boards of both companies. The combined enterprise will have assets of approximately \$323,000,000, and a combined steel ingot producing capacity of approximately 6,000,000 tons annually.

IN THE HOUSE OF COMMONS on July 31, during the debate on the report of H.M. Chief Inspector of Factories and Workshops for 1933, Mr. Lewis Jones, Member for Swansea W., said he wished to thank the Home Office, and the Chief Inspector particularly, for the reference to the assistance given not by "those two wonderful voluntary organisations that are doing so much for safety, namely, the Industrial Welfare Society and the Safety First Association."

MR. GEORGE E. BROWN, F.I.C., of 11 The Crescent, Surbiton, died on August 23.

A DEFECTIVE ELECTRIC CIRCUIT is considered to have been responsible for a slight outbreak of fire at the premises of the Fleetwood Chemical Co., Ltd., Princes Street, Deptford, on August 24.

MR. WALTER CORNELL FISON, of Ford Place, Thetford, Norfolk, who died on April 7 last, has left £112,802. Mr. Fison was a director of Fison, Packard and Prentice, Ltd., fertiliser manufacturers and maltsters, of Ipswich.

A STRIKE AT THE WORKS of the Viscose Development Co., Ltd., Bromley, Kent, was extended last Saturday by the refusal of nearly a hundred girls to return to work. The dispute is the outcome of the dismissal of three men, following which 30 of their colleagues in the same department went on strike. While the men allege that the dismissals were the result of the men joining the Transport and General Workers' Union, the employers say that reorganisation of staff and shortage of work were the reasons.

THERE IS AN INCREASING DEMAND for carrigeen in the Lancashire cotton industry where it is used in the finishing of cotton fabrics, according to an official report issued by the Irish Free State Government. At the present time supplies in Ireland are not adequate to the demand and some difficulty is experienced in the cleaning and drying of the carrigeen after it has been gathered, principally owing to the primitive methods employed. Prices paid to the gatherers are 2s. 6d. per stone for the best quality carrigeen and 1s. 6d. per stone for good average quality. Most of it is marketed through the Gaeltacht Division of the Irish Free State Government.

THE CZECHOSLOVAK CHEMICAL INDUSTRY continued to supply the greater share of domestic chemical consumption in 1933 and even increased its domestic sales, notwithstanding that prices often were above world levels. "Aussiger Verein" (Verein fuer Chemische und Metallurgische Produktion, Aussig), accounting for approximately one-half of total chemical production, decided to distribute a dividend of 10 per cent.; its gross profit for 1933 amounted to \$3,320,000. The "Solo" United Czechoslovak Match and Chemical Factories, Ltd., reported a net profit for 1933 of \$276,000. "Koliner Chemische" (Aktienfabrik zur Erzeugung von Chemikalien, Kolin) for the same year registered a profit of only \$20,000, reported that sales during the first few months of 1934 were more satisfactory than last year.

THE NATIONAL SMOKE ABATEMENT SOCIETY will hold their sixth annual conference at Glasgow, September 27 to 29. The proceedings will open with a reception by the Lord Provost in the City Chambers. The annual general meeting will be held on Friday morning, September 28. Further information may be obtained from the Secretary, National Smoke Abatement Society, 36 King Street, Manchester 2, up to September 25, and afterwards at the Conference Office, Smoke Abatement Conference, North British Station Hotel, Glasgow.

THE PROPOSED INDIAN ACADEMY OF SCIENCE has been finally inaugurated in Bangalore under the presidentship of Dr. Metcalfe, vice-chancellor of the Mysore University. The proceedings were opened with a welcome address by Sir Mirza Ismail, the Dewan of Mysore. Dr. S. Wheeler, principal of the Royal Institute of Science, Bombay, delivered a scientific address. The proceedings lasted for four days, during which 25 research papers were presented. A Council of 15 members has been appointed to govern the Academy. Sir C. V. Raman has been elected president; Dr. Wheeler and Dr. Metcalfe, vice-presidents.

SPEAKING AT THE ANNUAL MEETING of H. and M. Goulding, Ltd., in Dublin recently, the chairman, Sir Lingard Goulding, said that although profits were slightly down, the directors recommended the same dividend as last year—6 per cent—placing £6,000 to depreciation account and carrying forward £3,977 to the next account. There was, he continued, a decrease in the consumption of fertilisers in the Irish Free State. The demand for superphosphate and other fertilisers for top-dressing grasslands had also been seriously reduced and had resulted in a substantial curtailment of production and sales. The chemical fertiliser factories in the Irish Free State, commented the chairman, are producing considerably less than they did a few years ago, owing to the reduction in consumption, and they are, in consequence, working a long way below their capacity.

THE NEW POST OFFICE ARRANGEMENTS for home air mail came into force last Monday. Mails are dispatched from London each week-day for conveyance by air to Birmingham, Liverpool, Manchester, Douglas, Belfast and Glasgow. The mails for Douglas and Belfast afford a later time of posting in London for first delivery the next day. Ordinary correspondence for the other towns mentioned will not benefit in time of delivery from transmission by air, but letters for all the towns named, if prepaid for express delivery, will be delivered in town areas the same day. The inclusive rates of postage for all classes of letters and letter packets is 1½d. for the first two ounces and 1d. for each additional ounce. The rate for postcards will be 1d. each. Thus, for an air mail letter, not exceeding two ounces in weight, and for a post card, the charges will be the same as for conveyance by ordinary inland mail.

THE IMPORT DUTIES ADVISORY COMMITTEE has received an application for the addition to the free list of metal alloys, unwrought, in blocks, ingots, cakes, bars and slabs (whether broken or not), containing more than 20 per cent. by weight of tin. Representations should be addressed in writing to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, Westminster, London, S.W.1, not later than September 21, 1934. The committee has decided not to make any recommendations in respect of applications for (a) an increase of the import duty on plaster of Paris, mineral white (ground gypsum) and calcium sulphate cements; (b) a variation of the duties on the following manufactures of cork: blocks, slabs, sheets, squares, boards and tiles; rings and washers; floats adapted for use on fishing nets; sheet cork shaped so as to be adapted for use in the manufacture of helmets; and insulating pipe covering; and (c) a reduction of the import duty on shrimps in brine.

THE IRISH FREE STATE SENATE has passed the second reading of the Industrial Alcohol Bill, which empowers the Government to set up five factories and one refinery for the production of industrial alcohol. Although in the Dail (Lower House) the Minister for Industry and Commerce, Mr. Sean Lemass, said that the cost of production of industrial alcohol would not exceed 1s. 9d. per gall., he admitted to the Senate that the cost could not be definitely given owing to the varying starch content of the potatoes. An average of 18 per cent. of starch would, he said, be sought in the potatoes which it was proposed to use in the factories under the control of Governmental Board. Another uncertain factor affecting the price was the disposal of the by-product or wash. He considered, however, that the cost of production would not exceed 2s. per gal. The Minister also expressed the opinion that industrial alcohol could be produced in the Irish Free State better than anywhere else. The price of petrol, he added, would not be substantially affected as the alcohol contained in the admixture would not be liable to the 8d. per gal. duty now imposed on petrol. Senator Guinness, objecting to the Bill, said that in those countries where similar schemes have been tried they had been found an uneconomic commercial proposition. Another objector to the measure was Senator Sir John Keane, who said that he did not object to the experimental nature of the scheme, but he did object to its being on such a large scale. There was, he thought, a danger of State schemes such as this being pushed forward on an unsound basis. The Bill now awaits its Committee and Final stages.

MR. WILLIAM WINWOOD GOSSAGE, grandson of the founder of the well-known soap firm, died on August 28, at Wood Hatch, Godalming, Surrey, where he was living in retirement. He was seventy-two years of age, and leaves a widow and four sons. Mr. Gossage was born at Widnes, and followed his father into the firm, of which he was head when he retired in 1912. He was mayor of the borough of Widnes in 1901 and 1902, the fifth in the line of mayors of which his father, the late Mr. F. H. Gossage, was the first in 1892 and 1893. Two years ago the whole of the Gossage plant at Widnes was closed down, and transferred either to Bromborough or Warrington. The cessation of soap making in Widnes was regarded as one of the greatest blows in the industrial life of the town.

New Chemical Trade Marks

Compiled from official sources by Gee and Co., patent and trade mark agents, Staple House, 51 and 52 Chancery Lane, London, W.C.2.

Opposition to the registration of the following trade marks can be lodged up to September 15, 1934.

Lankol. 543,381. Class 2. Chemical substances used for agricultural, horticultural, veterinary, and sanitary purposes. Lancashire Tar Distillers, Ltd., Arkwright House, Parsonage Gardens, Manchester, 3. July 27, 1933.

Alvar. B548,660. Class 1. Synthetic resin in powdered form being a chemical substance for use as an ingredient in manufactures. Shawinigan, Ltd., Marlow House, Lloyd's Avenue, London, E.C.3. February 14, 1934.

Zymol. 552,184. Class 1. Chemical substances for use in bleaching textile fabrics in the course of manufacture. Greenwood and Chesters, Ltd., Weldon Works, Plymouth Grove West, Manchester, 13. June 26, 1934.

Opposition to the registration of the following trade marks can be lodged up to September 29, 1934.

Furnikola. 549,819. Class 1. A chemical compound to be used as a substitute for glue. Lactocol, Ltd., 17-18 Railway Approach, London Bridge, London, S.E.1. March 26, 1934.

Henco. 552,589. Class 1. Paints, varnishes, enamels (in the nature of paint), colours, distempers, japans, lacquers, paint and varnish driers, wood preservatives, wood stains, anti-corrosive and anti-fouling compositions, and anti-corrosive oils. Titanite-Emallite, Ltd., Sheaveshill Avenue, Colindale Lane, London, N.W.9. July 13, 1934.

Pinosin. 552,080. Class 1. Chemical substances used in manufactures, photography or philosophical research, and anti-corrosives. British Dyestuffs Corporation, Ltd., Imperial Chemical House, Millbank, London, S.W.1. June 20, 1934.

Rotorsol. 551,376. Class 4. Raw, or partly prepared, vegetable, animal, and mineral substances used in manufactures, not included in other classes. British Dyestuffs Corporation, Ltd., Imperial Chemical House, Millbank, London, S.W.1. May 24, 1934.

Company News

Pinchin, Johnson & Co.—An ordinary interim dividend of 7½ per cent., less tax, is announced, payable on September 17.

Reckitt and Sons.—A quarterly interim of 5 per cent. has been declared on the ordinary shares, payable on October 1.

United Indigo and Chemical Co.—The net profit for the year to June 30 amounted to £8,824. A sum of £15,184 is carried forward to the next account. The annual meeting will be held at Manchester on September 5, at 11 a.m.

Latest Oil Prices

LONDON, August 29.—LINSEED OIL was quiet. Spot £22 (small quantities 30s. extra); Sept.-Dec., £20 12s. 6d.; Jan.-April, £20 15s.; May-Aug. £21, naked. SOYA BEAN OIL was steady. Oriental (bulk), Aug.-Sept. shipment, £16 per ton. RAPE OIL was steady. Crude extracted, £27; technical refined, £28 10s.; naked ex wharf. COTTON OIL was easier. Egyptian crude, £14 10s.; refined common edible, £17 5s.; deodorised, £18 15s.; naked, ex mill (small lots 30s. extra). TURPENTINE was steady. American, spot, 41s. per cwt.

HULL.—LINSEED OIL.—Spot quoted £21 per ton; Aug. and Sept.-Dec., £20 12s. 6d.; Jan.-April, £20 10s.; naked. COTTON OIL.—EGYPTIAN, crude, spot, £14 10s.; edible, refined, spot, £16 10s.; technical, spot, £16 10s.; deodorised, £18 10s.; naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £14 10s.; naked. GROUND NUT OIL.—Extracted, spot, £20 10s.; deodorised, £24 10s. RAPE OIL.—Extracted, spot, £26; refined, £27 10s. SOYA OIL.—Extracted, spot, £17; deodorised, £20 per ton. COD OIL (industrial), 25s. per cwt. CASTOR OIL.—Pharmaceutical, 36s.; first, 31s.; second, 28s. per cwt. TURPENTINE, American, spot, 43s. per cwt.

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